LIMITED REMEDIAL INVESTIGATION

PIG'S EYE DUMP
RAMSEY COUNTY, MINNESOTA

VOLUME I
FINAL REPORT

Prepared for

Minnesota Pollution Control Agency
520 Lafayette Road North
St. Paul, Minnesota 55155

MPCA Contract Work Order No.	:	M6823
PRC Project No.	:	080-0004
Date Prepared	:	November 30, 1994
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LIST OF SYMBOLS, ACRONYMS, AND ABBREVIATIONS

%RSD	-	Percent relative standard deviation
μg/L	-	Microgram per liter
AWQC	-	Ambient Water Quality Criteria
bgs	-	Below ground surface
BTEX	-	Benzene, toluene, ethylbenzene, and xylene
CCAL	-	Continuing calibration
CERCLIS	-	Comprehensive Environmental Response, Compensation, and Liability Information System
CLP	-	Contract Laboratory Program
CRQL	-	Contract required quantitation limit
CSL	-	Close support laboratory
DCA	-	Dichloroethane
DCB	-	Dichlorobenzene
DCE	-	Dichloroethene
ECD	-	Electron capture detector
Enviroscience	-	Enviroscience, Inc.
EPA	-	U.S. Environmental Protection Agency
ESI	-	Expanded site inspection
FID	-	Flame ionization detector
Fromm	-	Fromm Applied Technology
GC	-	Gas chromatograph
GC/MS	-	Gas chromatography/mass spectroscopy
gpm	-	Gallon per minute
HRS	-	Hazard Ranking System
HSA	-	Headspace Autosampler
Huntingdon	-	Huntingdon Engineering and Environmental, Inc.
ICAL	-	Initial calibration
ID	-	Inside diameter
LRI	-	Limited remedial investigation
MDH	-	Minnesota Department of Health

LIST OF SYMBOLS, ACRONYMS, AND ABBREVIATIONS (Continued)

MDL	-	Method Detection Limit
MDNR	-	Minnesota Department of Natural Resources
MIBK	-	Methyl isobutyl ketone
mL	-	Milliliter
MPCA	-	Minnesota Pollution Control Agency
MSL	-	Mean sea level
MS/MSD	-	Matrix spike/matrix spike duplicate
MWCC	-	Metropolitan Waste Control Commission
NPL	-	National Priorities List
PA	-	Preliminary assessment
PAH	-	Polynuclear aromatic hydrocarbon
PCA	-	Perchloroethane
PCB	-	Polychlorinated biphenyl
PCE	-	Perchloroethene
PID	-	Photoionization detector
Pig's Eye	-	Pig's Eye Landfill
PLP	-	Permanent List of Priorities
ppb	-	Part per billion
ppm	-	Part per million
PRC	-	PRC Environmental Management, Inc.
PRT	-	Post-run tubing
QA/QC	-	Quality assurance and quality control
QC	-	Quality control
RAL	-	Recommended Allowable Limit for Drinking Water Contaminants
RCRA	-	Resource Conservation and Recovery Act
RPD	-	Relative percent difference
SOG	-	Standard operating guideline
SOP	-	Standard operating procedure
SSI	-	Screening site inspection
SVOC	-	Semivolatile organic compound
TAL	-	Target analyte list

LIST OF SYMBOLS, ACRONYMS, AND ABBREVIATIONS (Continued)

TCA	-	Trichloroethane
TCE	-	Trichloroethene
TCLP	-	Toxicity characteristic leaching procedure
TIC	-	Tentatively identified compound
USCS	-	Unified Soil Classification System
VOC	-	Volatile organic compound

EXECUTIVE SUMMARY

PRC Environmental Management, Inc. (PRC), has prepared this draft limited remedial investigation (LRI) report for the Minnesota Pollution Control Agency (MPCA) in partial fulfillment of Work Order No. M-6823 under Multi-Site III Contract No. M-6823. This report documents the LRI conducted at the Pig's Eye dump (Pig's Eye) site in St. Paul, Minnesota. The report was prepared after the completion of the LRI work plan by MPCA, the health and safety plan by PRC, and field work conducted by both MPCA and PRC. The limited nature of the LRI was directed by the MPCA project manager. The LRI does not include evaluations or discussions of contaminant fate and transport or risk assessment.

The Pig's Eye site is an inactive dump located approximately 3 miles southeast of downtown St. Paul in Ramsey County, Minnesota. The site covers about 320 acres and is situated in Sections 3, 4, and 10 of Township 22 North, Range 16 West. The site is bordered to the north and east by the Soo Line railyard and an unnamed access road, to the south by Pig's Eye Lake, and to the west by Pig's Eye Lake Road. The Pig's Eye site is undeveloped except for a small area in the western portion of the site. This area is occupied by the City of St. Paul's wood recycling facility which occupies about 10 to 15 acres and consists of a small one-room building containing an office, equipment for chipping and shredding, and piles of wood.

The remainder of the site consists of wooded and grassy areas. During wet times of the year, standing water is present in the low-lying areas, especially in the middle and southern portions of the site. The northern portion of the site is more heavily wooded. A study of historical aerial photographs shows that areas of the site were composed of wetlands and small lakes before dumping operations took place. Battle Creek enters the site at its eastern boundary, flows west across the site, and then bends to the south and enters Pig's Eye Lake. Small ponds are now present in the southwest and southeast portions of the site.

The Pig's Eye site was operated by the City of St. Paul as a dump from about 1956 until 1972. The dump was closed in 1972 by order of MPCA, mainly as a result of its location in the Mississippi River flood plain. The Pig's Eye dump accepted both municipal and industrial wastes from the City of St. Paul and surrounding communities. The dump is estimated to have accepted 8.23 million cubic yards of waste material during its 16 years of operation.

From 1977 through 1985, the Metropolitan Waste Control Commission (MWCC) disposed of sewage sludge ash in the southern part of the site under a permit from MPCA. About 236,642 cubic yards of ash was placed on 31 acres of the site. After the ash was placed on site, it was covered with 6 inches of soil cover.

In July 1988, part of the site near the wood recycling facility caught fire. An emergency response contractor for MPCA detected hydrogen cyanide in the smoke plume from this fire. Information from the City of St. Paul indicates that portions of the site also caught fire at other times in the past.

In 1981, the U.S. Environmental Protection Agency (EPA) received a Notification of Hazardous Waste Site form from a local hauler indicating that barrels of solvents and paint sludges were transported to the Pig's Eye site. The Pig's Eye site was then placed on EPA's Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) inventory of potential hazardous waste sites.

In 1983, EPA performed a preliminary assessment (PA) at the site. In December 1988 and January 1989, MPCA staff conducted a screening site inspection (SSI) at the site. After the completion of the SSI, the Pig's Eye site was placed on the State of Minnesota's Permanent List of Priorities (PLP) in December 1989.

Because the data obtained during the SSI documents a release of hazardous substances, MPCA determined that additional data was needed to further assess potential environmental impacts from the site. An expanded site inspection (ESI) was therefore conducted to collect data to develop a more refined Hazard Ranking System (HRS) score and to assess the likelihood of the site to qualify for the National Priorities List (NPL).

On January 31, 1994, MPCA authorized PRC to conduct the LRI, and PRC conducted on-site field and sampling activities from April to October 1994. The field activities were divided into two major activities: a contaminant source and geophysical investigation; and a geologic and hydrogeologic investigation.

Soil gas and groundwater samples were collected during the contaminant source investigation. Soil gas and groundwater surveys and sampling were conducted to identify sources of contamination. The purpose of the contaminant source investigation was to delineate zones of gross contamination and provide real-time information to help determine the locations of the monitoring wells and trenches installed for the geologic and hydrogeologic investigation. The purpose of the geophysical survey was to identify the extent of fill material at the site.

The geologic and hydrogeologic investigation included installing 12 monitoring wells and 4 stream gages; digging 4 trenches; sampling and analyzing groundwater, sediment, and surface water; surveying monitoring well and stream gages; and measuring groundwater and surface water elevations.

The site-specific geology characterized during the LRI indicates that the Pig's Eye site is underlain by Late Wisconsinan- and Holocene-aged unconsolidated sediments of the modern Mississippi River and the ancient Phalen Channel. Based on observations made during monitoring well installation activities, two shallow water-bearing units may be present. An upper, unconfined unit is present at the interface of the fill material and the organic silt and peat unit. A deeper confined or semiconfined unit may be present in the sand unit below the organic silt and peat unit. Although well nests were not installed during the LRI, it appears that the organic silt and peat unit may act as a local semiconfining or confining unit. Both of these water-bearing units, however, are considered part of the larger unconsolidated valley fill aquifer that fills the buried Phalen Channel. Because the sand unit lies directly over bedrock, the shallow water-bearing units below the site are also in direct hydrogeologic contact with the underlying Prairie du Chien-Jordan Aquifer.

An analysis of groundwater and stream gage elevation measurements for the upper water-bearing unit and surface water bodies indicates that groundwater mounding occurs both northeast and southwest of Battle Creek. Groundwater flows and discharges to the Mississippi River, Battle Creek, and Pig's Eye Lake.

Contaminants detected in groundwater, surface water, and sediment at the Pig's Eye site include volatile organic compounds (VOC), semivolatile organic compounds (SVOC), metals, pesticides, and polychlorinated biphenyls (PCB). The aerial extent of contamination in groundwater, surface water, and sediment occurs in a random fashion with no patterns discernible from the analytical results. This observation is expected because of the types of wastes and management practices at the site.

Results of analytical data for groundwater, surface water, and sediment samples collected at the Pig's Eye site indicate that an impact to the environment has occurred from the Pig's Eye site. Contaminants have migrated through the upper-water bearing unit to the lower-water bearing unit. Leachate from the site also discharges to on-site surface water bodies that are hydrologically connected to the Mississippi River. One major source area, an area of abandoned battery casings, has been identified in the southern portion of the site.

Based on the results of the LRI and to further characterize site conditions, PRC recommends the following:

- Additional monitoring wells should be installed in the deeper unconsolidated valley fill deposits underlying the site. If groundwater from these wells also shows contamination, installation of bedrock monitoring wells at the site should be considered.

- Groundwater samples from the monitoring wells should also be analyzed for oxygen, nitrates, and sulfates to determine whether or not natural bioremediation is occurring at the site.

- Monitoring well nests should be installed in the shallow and deeper water-bearing units to determine if the organic silt and peat unit acts as a semiconfining or confining unit at the site.

- Seismic or other nonintrusive geophysical survey methods, such as a gravity survey, should be performed to locate the axis of the buried valley.

- Toxicity Characteristic Leaching Procedure (TCLP) analysis of the ash from the ash disposal area and soil and sediment near the battery casings disposal area should be performed to determine if the materials are Resource Conservation and Recovery Act (RCRA) hazardous wastes. If TCLP analysis indicates that this material is above TCLP limits for RCRA hazardous waste, the soil, battery casings, and ash should either be removed or remediated.

- Invertebrate sampling and additional sediment sampling in Battle Creek and Pig's Eye Lake should be conducted in order to assess potential impact of the site on the food chain in the area.

1.0 INTRODUCTION

PRC Environmental Management, Inc. (PRC), has prepared this limited remedial investigation (LRI) report for the Minnesota Pollution Control Agency (MPCA) in partial fulfillment of Work Order No. M-6823 under Multi-Site III Contract No. M-6823. This report documents the LRI conducted at the Pig's Eye dump (Pig's Eye) site in St. Paul, Minnesota. This report was prepared after the completion of the LRI work plan by MPCA, the health and safety plan by PRC, and field work conducted by both MPCA and PRC. The limited nature of the LRI was directed by the MPCA project manager. The LRI does not include evaluations or discussions of contaminant fate and transport or a risk assessment. This LRI report has been prepared in accordance with the most current U.S. Environmental Protection Agency (EPA) guidance (EPA 1988) as modified from discussions with the MPCA project manager. This section discusses the LRI objectives and the organization of the LRI report.

1.1 LRI OBJECTIVES

The objectives for the LRI as stated in MPCA's work plan and discussed with the MPCA project manager are as follows:

- Evaluate the magnitude and extent of contamination in on-site soil, sediment, groundwater, and surface water
- Evaluate the lateral extent of fill material using geophysical techniques
- Evaluate the presence of volatile organic compounds (VOC) in the soil gas within the fill material
- Characterize the groundwater quality of the uppermost aquifer
- Characterize the water quality of potentially impacted surface water bodies adjacent to the site
- Characterize the sediment in surface water bodies adjacent to the site
- Characterize the composition of the fill material by trenching

1.2 LRI REPORT ORGANIZATION

This LRI report is bound in two volumes. Volume I consists of an executive summary and seven sections including references. Figures and tables for each section are presented at the end of the appropriate section. A short description of each section is provided below.

- The Executive Summary provides a general overview of the information in the LRI report.
- Section 1.0, Introduction, presents the objectives of the LRI and presents the LRI report organization.
- Section 2.0, Site Background and History, discusses the site location, layout, history and response actions, and previous investigations.
- Section 3.0, LRI Activities, describes the field activities conducted during the LRI.
- Section 4.0, Physical Setting, presents information on population and land use, physiography, climate, soil types, and regional and site-specific geology, and regional and site-specific hydrogeology.
- Section 5.0, Nature and Extent of Contamination, discusses sampling results and the types and levels of contaminants detected in the various environmental media sampled.
- Section 6.0, Conclusions and Recommendations, summarizes the data collected during the LRI and presents PRC's recommendations for future site work.
- Section 7.0, References, lists all sources of information cited within the text of this report.

Volume II of the LRI report contains the appendixes. The Volume II appendixes include the following:

- Appendix A, Land Survey Report
- Appendix B, Geophysical Survey Report
- Appendix C, PRC Standard Operating Procedures (SOP)
- Appendix D, Boring Logs
- Appendix E, Monitoring Well Completion Diagrams

- Appendix F, Contract Laboratory Program (CLP) Data Summary and Data
- Appendix G, PRC's Close Support Laboratory (CSL) Data Summary and Method Detection Limits

2.0 SITE BACKGROUND AND HISTORY

Background information about the Pig's Eye site and site history are presented in this section. Background information includes information about the site location and layout. Site history information includes the site history and response actions and summarizes previous investigations conducted at the Pig's Eye site.

2.1 SITE LOCATION

The Pig's Eye site is an inactive dump located approximately 3 miles southeast of downtown St. Paul in Ramsey County, Minnesota. The original, leased property of the dump covers about 320 acres and is situated in Sections 3, 4, and 10 of Township 22 North, Range 16 West. The actual filled area measures approximately 250 acres. The site is bordered to the north and east by the Soo Line rail yard and an unnamed access road, to the south by Pig's Eye Lake, and to the west by Pig's Eye Lake Road. Figure 2-1 shows the Pig's Eye site location.

2.2 SITE LAYOUT

The Pig's Eye site is undeveloped except for a small area in the western portion of the site. This area is occupied by the City of St. Paul's Wood Recycling Facility. This facility covers about 10 to 15 acres and consists of a small one-room building containing an office, equipment for chipping and shredding, piles of wood and wood chips, and stock piled trees.

The remainder of the site consists of wooded and grassy areas. During wet times of the year, standing water is present in the low-lying areas, especially in the middle and southern portions of the site. The northern portion of the site is moderately wooded. A study of historical aerial photographs shows that areas of the site were composed of wetlands and small lakes before dumping operations took place. Battle Creek enters the site at its eastern boundary, flows west across the site, and then bends to the south and enters Pig's Eye Lake. Small ponds are now present in the southwest and southeast portions of the site.

Most of the waste at the site is covered with soil. In some areas, however, waste is not fully covered and protrudes through surface soil. Numerous unpaved roads cross the site. During wet times of the year, many of the roads are passable only with four-wheel drive, off-road vehicles. The Metropolitan Waste Control Commission (MWCC) has installed a sewer line across the site. The site is not fenced; therefore, access to the site is not restricted.

2.3 SITE HISTORY AND RESPONSE ACTIONS

The following discussion pertaining to site history and response actions is based on information obtained from MPCA's screening site inspection (SSI) and expanded site inspection (ESI) reports (MPCA 1989 and 1992).

The Pig's Eye site operated as a dump from about 1956 until 1972. The dump property was owned and operated by the City of St. Paul. Because the dump operated before the inception of MPCA, it was not a permitted landfill. The dump was closed in 1972 by order of MPCA, mainly as a result of its location in the Mississippi River flood plain. The dump accepted both municipal and industrial wastes from the City of St. Paul and surrounding communities. The dump is estimated to have accepted 8.23 million cubic yards of waste material during its 16 years of operation.

From 1977 through 1985, MWCC disposed of sewage sludge ash in the southern part of the site under a permit from MPCA. About 236,642 cubic yards of ash was placed on 31 acres of the site. After the ash was placed on site, it was covered with 6 inches of soil cover.

In July 1988, the site caught fire near the wood recycling facility. The ignition source of this aboveground fire is unknown. An emergency response contractor of MPCA's detected hydrogen cyanide in the smoke plume from this fire. Information from the City of St. Paul indicates that portions of the site also caught fire at other times in the past.

2.4 PREVIOUS INVESTIGATIONS

In 1981, EPA received a Notification of Hazardous Waste Site form from a local hauler indicating that barrels of solvents and paint sludges were transported to the Pig's Eye site (EPA 1981). The Pig's Eye site was then placed on EPA's Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) inventory of potential hazardous waste sites.

In 1983, a preliminary assessment (PA) was performed at the site (EPA 1983). In December 1988 and January 1989, MPCA staff conducted an SSI at the site (MPCA 1989). During the SSI, six soil samples, six groundwater samples, two surface water samples, and one residential well sample were collected. Three permanent monitoring wells were also installed (MPCA 1989).

Analysis of the soil samples, which were collected from borings through fill material, revealed lead, mercury, endrin, ketone, and bis (2-ethylhexyl)phthalate at levels of greater than three times those in off-site soil samples. Naphthalene and 2-methylnaphthalene also were detected, but at levels less than CLP contract required quantitation limits (CRQL). Specific concentrations are presented in the SSI report prepared by MPCA (MPCA 1989).

Groundwater samples were collected from three temporary monitoring wells installed in on-site soil borings. Analysis of groundwater samples collected from these wells revealed the following organic compounds at levels greater than CRQLs: methylene chloride; naphthalene; 2-methylnaphthalene; 1,2-dichlorobenzene (DCB); and Arochlor 1016. The following inorganic compounds were also detected at levels greater than CRQLs: cobalt, mercury, vanadium, and cyanide. The samples, however, were noted as being very turbid and potentially not representative of actual groundwater concentrations.

Groundwater samples were also collected from permanent on-site monitoring wells MW-1, MW-2, and MW-3. Analysis of these groundwater samples revealed arsenic, chromium, cyanide, lead, mercury, cobalt, and vanadium at concentrations of greater than three times those from an off-site monitoring well. Analysis of surface water samples did not document an observed release.

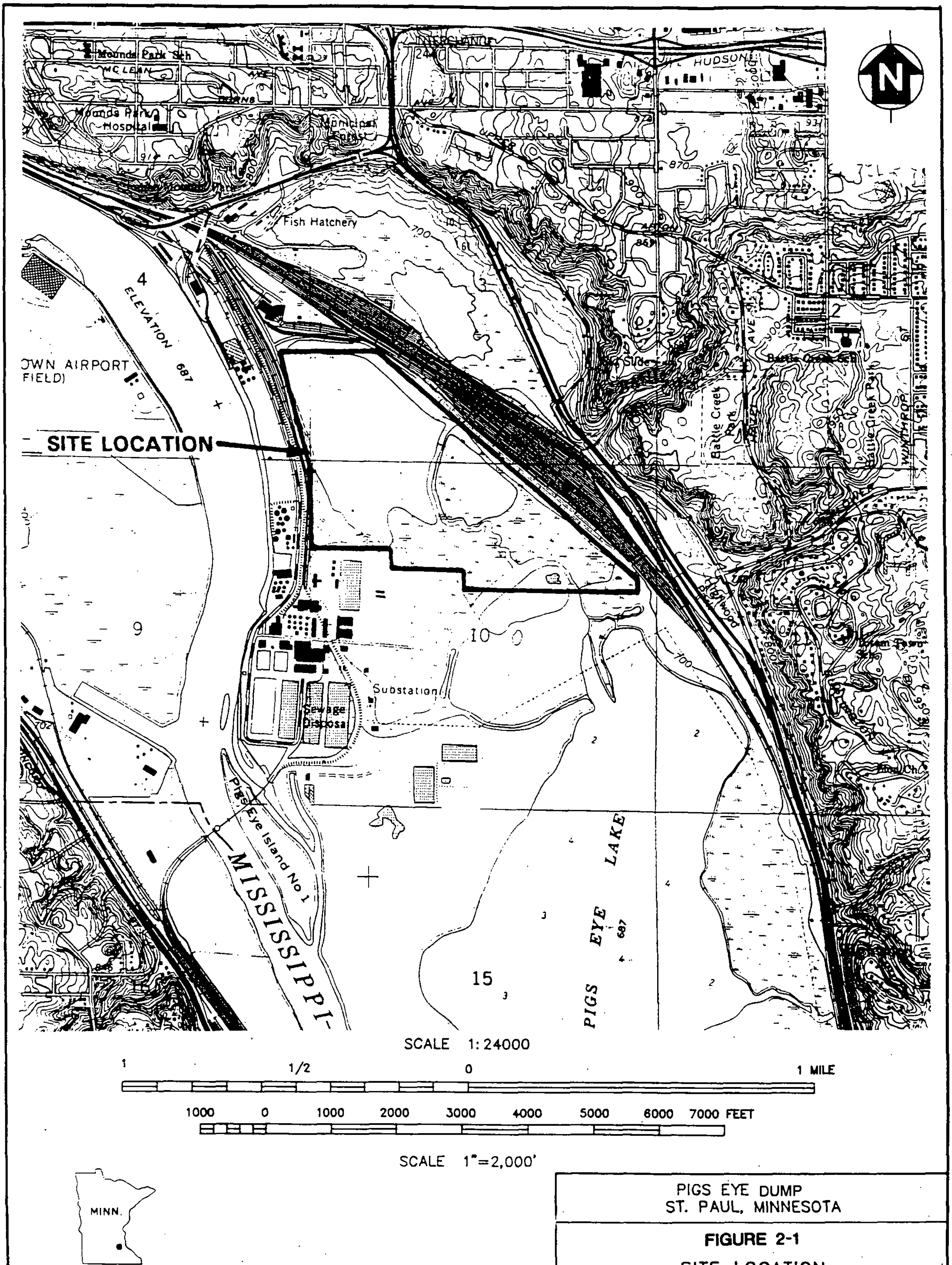
After the completion of the SSI, the Pig's Eye site was placed on the State of Minnesota's Permanent List of Priorities (PLP) in December 1989.

Because the data obtained during the SSI documents a release of hazardous substances, MPCA determined that additional data was needed to further assess potential environmental impacts from the site. Therefore, an ESI was conducted to collect data to develop a more refined Hazard Ranking System (HRS) score and to assess the likelihood of the site to qualify for the National Priorities List (NPL) (MPCA 1992). The ESI involved collecting three surface soil samples, nine sediment samples, and nonsampling data.

The three surface soil samples were collected in the area where MWCC disposed of sewage sludge ash. Analysis of the samples revealed cadmium, chromium, copper, lead, nickel, silver, and zinc at levels greater than CRQLs. Specific concentrations are presented in the ESI report prepared by MPCA (MPCA 1992).

Sediment samples were collected during the ESI from Battle Creek and Pig's Eye Lake and at two background locations in Battle Creek upstream from the site. Analysis of the sediment samples from Battle Creek revealed arsenic, beryllium, cadmium, chromium, copper, nickel, and zinc at concentrations greater than those in samples from background locations in Battle Creek. Several organic compounds also were detected in sediment samples from Battle Creek. Chlorobenzene, bis (2-ethylhexyl)phthalate, indeno (1,2,3-cd) pyrene, and chlordane were detected in creek sediment samples but not in background samples. Endrin also was detected in a creek sediment sample at a concentration of greater than three times background.

Analysis of the sediment samples collected from Pig's Eye Lake revealed cadmium, lead, mercury, and zinc at concentrations higher than those in background samples. Several organic compounds including bis (2-ethylhexyl)phthalate, indeno (1,2,3-cd) pyrene, and Arochlor 1254 were detected in the lake sediment samples.



SOURCE: MODIFIED FROM USGS, ST. PAUL EAST QUADRANGLE, 1993

PIGS EYE DUMP
ST. PAUL, MINNESOTA

FIGURE 2-1

SITE LOCATION

PRC ENVIRONMENTAL MANAGEMENT, INC.

3.0 LRI ACTIVITIES

The following sections describe the LRI activities conducted by PRC as directed by MPCA (MPCA 1994). The LRI activities included a land survey, geophysical survey, soil gas survey and groundwater sampling using PRC's Geoprobe™, monitoring well groundwater and surface water sampling and elevation measurements, sediment sampling, and trenching.

3.1 LAND SURVEY

PRC subcontracted Enviroscience Inc. (Enviroscience) of Eden Prairie, Minnesota, to conduct a land survey at the Pig's Eye site. The objective of the land survey was to provide a grid on which to conduct the LRI activities listed below. Enviroscience surveyed the grid at the site during the week of March 21, 1994. The grid consisted of surveyed points 180 feet apart in the northwest to southeast direction and 200 feet apart in the southwest to northeast direction. Grid points were marked with wooden stakes and labeled with permanent marker. The survey points were tied into the Minnesota State Plane Coordinate System. The grid was then used to identify geophysical points and soil gas, groundwater, sediment, and surface water sampling locations. Appendix A of the report discusses the land survey in detail.

3.2 GEOPHYSICAL SURVEY

PRC contracted Fromm Applied Technology (Fromm) of Mequon, Wisconsin, to conduct a geophysical survey of the Pig's Eye site. The objective of the geophysical survey was to identify the extent of fill material at the site. Fromm conducted the geophysical survey the week of March 28, 1994. The specific equipment and methods used by Fromm are presented in Appendix B of this report.

3.3 SOIL GAS SURVEY

PRC conducted a soil gas survey to locate potential source areas of VOCs in the shallow fill material at the site. The soil gas survey was conducted by PRC during the weeks of April 18 and April 25, 1994. PRC collected soil gas samples at 105 locations at depths of between 3 to 10 feet below ground surface (bgs) (see Figure 3-1). Because of extremely wet conditions near the north-central portion of the site, soil gas sampling was limited to the northwest, south, and southeast portions of the site. The depth at which individual soil gas samples were collected depended on the depth to groundwater at each specific location.

Soil gas samples were collected using the post-run tubing (PRT) method. This method consists of driving a Geoprobe™ rod to the sampling depth and then withdrawing the rod about 6 inches to dislodge the expendable point. A vacuum is then applied to purge the polyethylene tubing, which extends down to the end of the rod. PRC purged about 2 liters of air through the tubing to ensure that all stagnant air was removed and that the sample was representative of soil gas conditions in the fill material. After purging, PRC collected a soil gas sample in a glass bulb.

A total of 105 samples were collected and analyzed by PRC's CSL for 16 chlorinated VOCs, eight polynuclear aromatic hydrocarbons (PAH), and other VOCs. PRC's CSL also analyzed several types of quality assurance and quality control (QA/QC) samples, including laboratory duplicates.and equipment blanks. Sampling depths at each sampling location are presented in Table 3-1. All soil gas sampling procedures were conducted in accordance with PRC SOP No. 054, Using the Geoprobe™ System (see Appendix C). A discussion of soil gas survey results is presented in Section 5.0.

3.4 GROUNDWATER SAMPLING USING PRC'S GEOPROBE™

PRC collected groundwater samples using its Geoprobe™ to obtain information regarding the nature and extent of groundwater contamination beneath the fill material and to help determine the locations of permanent monitoring wells. PRC personnel collected the groundwater samples during the weeks of April 25 and May 2, 1994. PRC collected groundwater samples at 40 locations across the site (see Figure 3-2). Because of extremely wet conditions near the north-central portion of the site, soil gas sampling was limited to the northwest, south, and southeast portions of the site. The groundwater samples were collected at depths of 4 to 18 feet bgs.

To ensure that an adequate water column was available for sampling, PRC drove a slotted, 2-foot long Geoprobe™ rod to a depth at least several feet below the groundwater surface. The groundwater for the VOC analysis was collected by drawing the groundwater inside the Geoprobe™ rod with flexible polyethylene tubing. The 40-milliliter (mL) sample vials were filled directly from the polyethylene tubing. Groundwater for the remainder of the analyses was collected by attaching a peristaltic pump to the polyethylene tubing inside the Geoprobe™ rod and pumping the groundwater directly from the tubing into the sample containers. After collecting groundwater samples, all geoprobe holes were pressure-grouted with a bentonite slurry to the ground surface.

A total of 52 samples, including six duplicates and three matrix spike/matrix spike duplicate (MS/MSD) pairs, were collected and analyzed by the CLP laboratory for VOCs; semivolatile organic compounds (SVOC); pesticides and polychlorinated biphenyls (PCB); and metals, including cyanide. PRC's CSL also analyzed the groundwater samples for 27 VOCs. Sampling depths at each sampling location are provided in Table 3-2. All groundwater sampling procedures were conducted in accordance with PRC SOP No. 054, Using the Geoprobe™ System (see Appendix C). A discussion of the analytical results for groundwater sampling is presented in Section 5.0.

3.5 MONITORING WELL INSTALLATION, GROUNDWATER SAMPLING, AND MONITORING WELL SURVEY AND GROUNDWATER LEVEL MEASUREMENT ACTIVITIES

The following sections describe the monitoring well installation, groundwater sampling, and monitoring well survey and groundwater level measurement activities conducted during the LRI.

3.5.1 Monitoring Well Installation

Based on the results of the groundwater sampling using PRC's Geoprobe™, 12 permanent monitoring wells, MW-4 through MW-15, were installed at the site. Ten of the wells were screened at the interface between the fill material and native soil beneath the fill material (shallow monitoring wells), and the other two wells were screened in the sand below the organic silt and peat unit (deep monitoring wells). The location of the monitoring wells is shown in Figure 3-3. The monitoring wells were installed by Huntingdon Engineering & Environmental Inc. (Huntingdon) under subcontract to MPCA during the weeks of August 15 and August 22, 1994.

The 10 shallow monitoring wells (MW-4 through MW-13) were installed using 4.5-inch inside diameter (ID) hollow-stem augers. The two deep monitoring wells (MW-14 and MW-15) were installed using 6.5-inch ID hollow-stem augers. Monitoring wells were numbered at the Pig's Eye site using the already established MPCA monitoring well numbering system. Huntingdon collected continuous split-spoon samples to aid in its preparation of the borings logs, which are presented in Appendix D. These samples were not submitted for chemical analysis. All drilling operations were supervised by a geologist from MPCA or PRC who was responsible for conducting health and safety monitoring, logging samples using the unified soil classification system (USCS), checking split-spoon samples for visual signs of contamination, and screening soil and groundwater samples using a photoionization detector (PID).

The shallow monitoring wells were constructed of 2-inch ID stainless-steel casing with flush joints and stainless-steel screens. Deep monitoring well MW-15 was constructed of 4-inch ID stainless-steel casing with flush joints and a stainless steel screen. Although a 4-inch ID casing and screen were planned for use at MW-14, bedrock was encountered at a shallow depth, and the well was therefore constructed with a 2-inch ID casing and screen.

The slot size of the screens was 0.010 inch (slot size No. 10) for all wells. The 5-foot long screens used for the shallow monitoring wells and MW-14 were manufactured by Johnson Filtration System, Inc. (screen and casing type 304). The screen used for MW-15 was 10 feet long and also manufactured by Johnson Filtration System, Inc. (also screen type 304).

Huntingdon placed silica filter sand (Ottawa sand type 10-20) from the bottom of the screen to approximately 3 feet above the top of the screen. A minimum of 1 foot of bentonite pellets was placed above the silica filter sand. A 1-foot thick concrete seal was placed above the bentonite to the ground surface at all monitoring wells. All wells were completed above grade with locking protective outer casings and concrete pads. Beacause of the location of the Pig's Eye site within the Mississippi River flood plain, the top of the outer casing of each well was sealed with a water-tight cap below the locking protective cap. Three protective posts were placed around each well. The top of the inner casing of each well was sealed with a water-tight cap. Monitoring well construction details for each well are presented in Appendix E.

Pumping and bailing methods were used to develop all newly installed wells. All monitoring well development was performed by Huntingdon. The monitoring wells were developed until the water discharge became relatively constant for three consecutive measurements of pH, specific conductance, temperature, and turbidity. Most of the shallow monitoring wells were developed by removing 20 to 30 well volumes of water. Development water was disposed of on site and discharged to the ground surface as directed by MPCA.

3.5.2 Groundwater Sampling

After the 12 new monitoring wells were installed, developed, and stabilized, PRC collected groundwater samples from the wells during the week of August 29, 1994. At this time, PRC also collected groundwater samples from two wells, MW-1 and MW-2, which were previously installed at the site by the MPCA. A third well, MW-3, was also previously installed by the MPCA; however, this well was not included in the groundwater sampling at the request of the MPCA. Because all groundwater samples from the new wells were collected within 24 hours of well development and because parameters for discharge stabilization had been met, purging and parameter measurement was not required. The two previously existing wells, however, were purged. All groundwater were samples were collected with disposable bailers in accordance with PRC SOP No. 010, Groundwater Sampling (see Appendix C).

A total of 15 samples, including one duplicate and one MS/MSD pair, were collected and analyzed by the CLP laboratory for VOCs; SVOCs; pesticides and PCBs; and metals, including cyanide. A discussion of the analytical results of groundwater sampling is presented in Section 5.0.

3.5.3 Monitoring Well Survey and Groundwater Level Measurement

To ensure the accurate location of sampling points and the delineation of contaminated areas, each new monitoring well was surveyed to determine its horizontal location, the elevation of the ground surface, and the elevation to the top of the inner well casing. Well locations were surveyed to within 0.1 foot for horizontal location. Elevations of the ground surface and top of the inner casing were surveyed to within 0.01 foot. The survey was completed in September 1994 by Enviroscience. All surveyed locations were tied into the Minnesota State Plane Coordinate System.

PRC and MPCA staff measured the depth to groundwater in each of the monitoring wells on September 14, October 4, and October 15, 1994. The depth to groundwater was measured using an electronic water level indicator. All measurements were made to the top of the inner casing, and the water level indicator was decontaminated before use in each well. The depth to groundwater in each of the wells is presented in Tables 4-1, 4-2, and 4-3.

3.6 SURFACE WATER SAMPLING AND ELEVATION MEASUREMENTS

With the assistance of MPCA technical staff, PRC collected surface water samples to characterize water from Battle Creek, an unnamed ditch on the east side of the site, a pond on the south part of the site, and Pig's Eye Lake. Surface water sample E1600S was collected from the pond on the south end of the site near the battery disposal area. Surface water samples were collected from five locations (see Figure 3-4). PRC and MPCA collected the surface water samples the week of June 6, 1994.

A total of eight samples, including one duplicate and one MS/MSD pair, were collected and analyzed by the CLP laboratory for VOCs; SVOCs; pesticides and PCBs; and metals, including cyanide. All surface water sampling procedures were conducted in accordance with PRC SOP No. 009, Sampling Surface Water (see Appendix C). A discussion of the surface water sampling analytical results is presented in Section 5.0.

PRC and MPCA also installed stream gages at four locations to measure the changes in surface water elevation. Two of the gages were placed in Battle Creek, one gage was placed in Pig's Eye Lake, and one gage was placed in the unnamed ditch on the east side of the site. The locations of the stream gages is presented in Figure 3-3. A discussion of the measurement results is presented in Section 4.0.

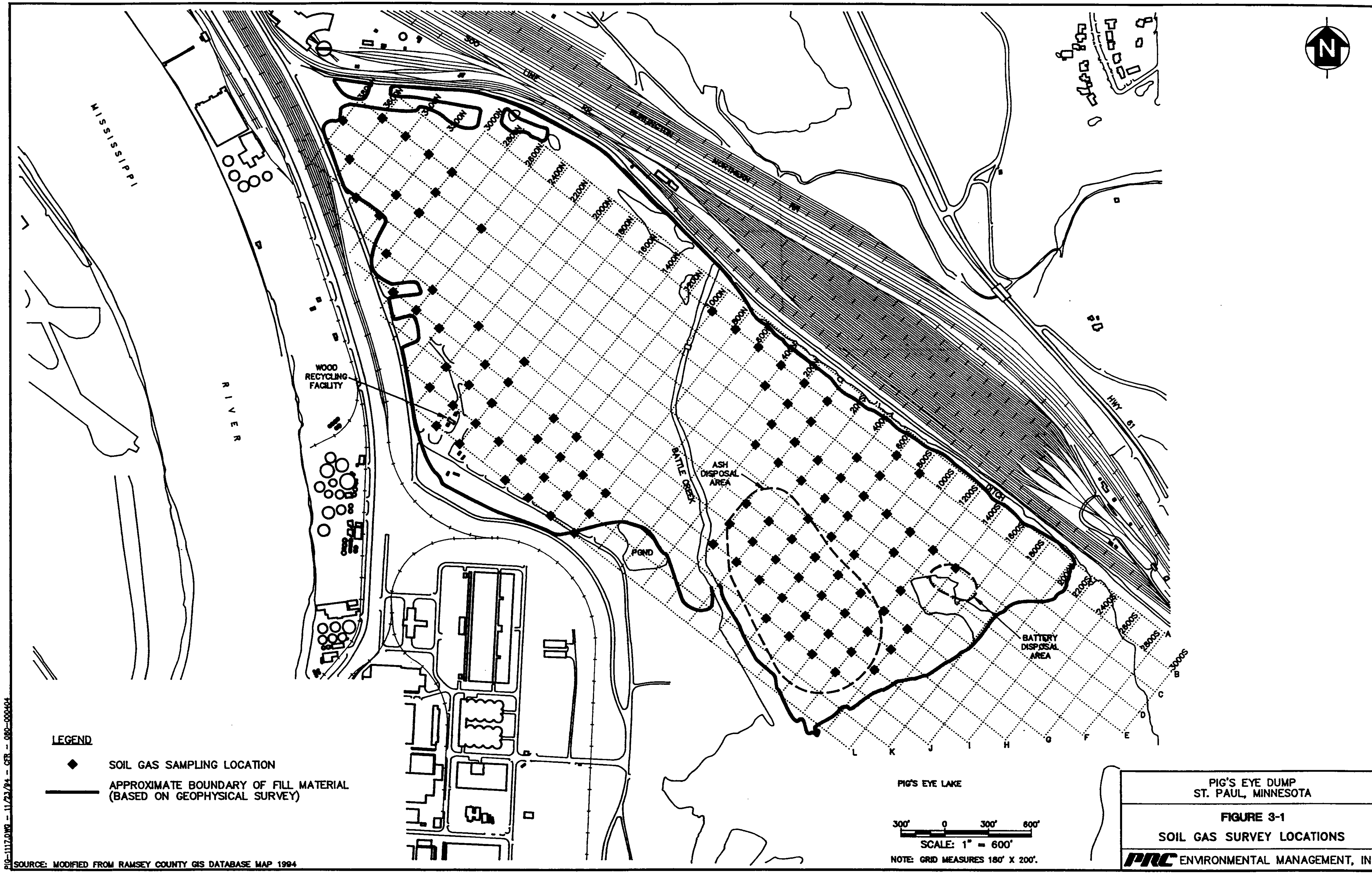
3.7 SEDIMENT SAMPLING

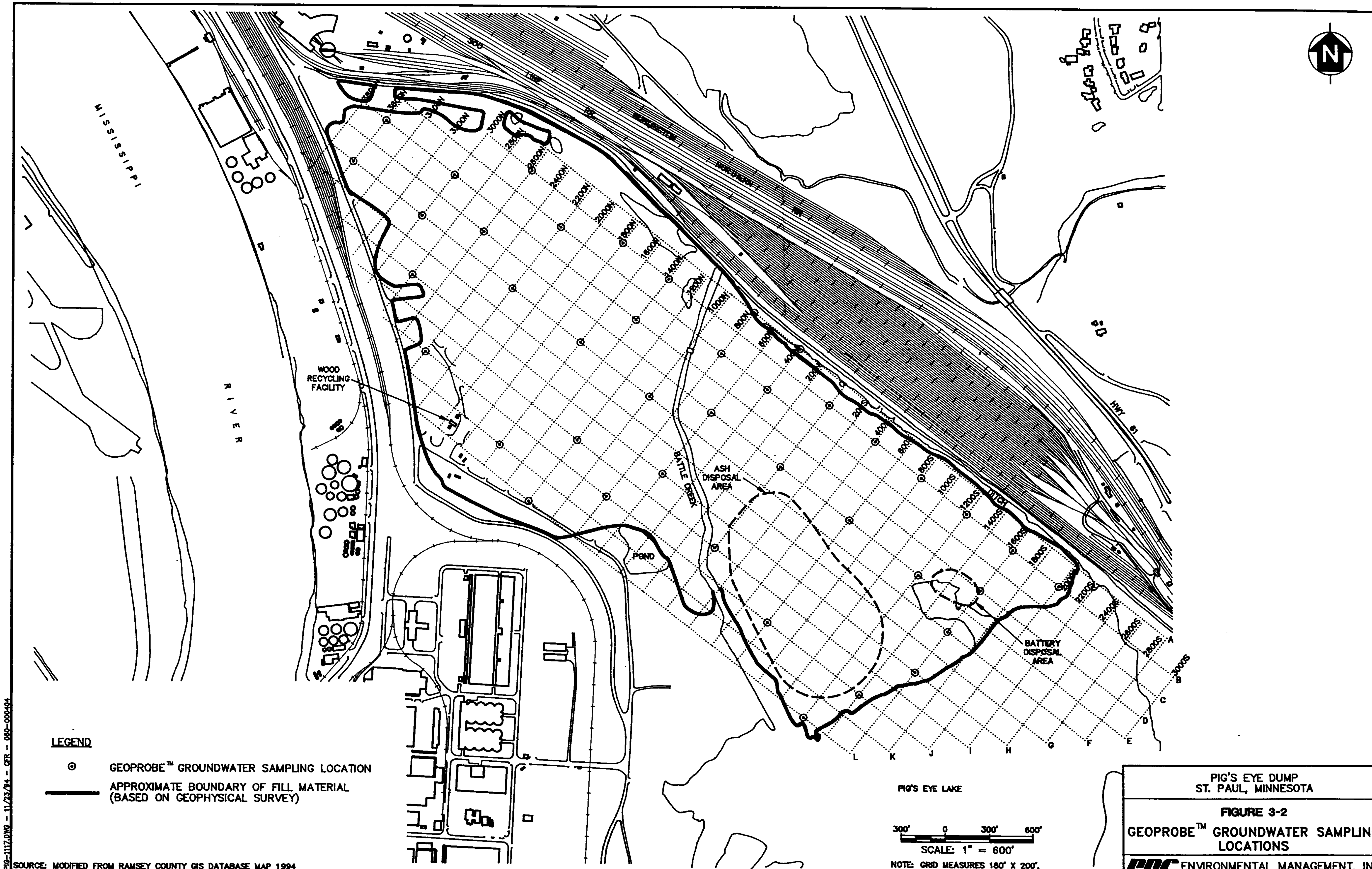
With the assistance of MPCA technical staff, PRC collected sediment samples on May 5, 1994 to characterize sediment from Battle Creek, an unnamed ditch on the east side of the site, a pond on the south part of the site, and Pig's Eye Lake. Sediment samples were collected from five locations with a core sampler (see Figure 3-5). Sediment samples (SED-1 and SED-2) were also collected on September 14, 1994 from the pond located along the southwest edge of the dump site. SED-1 was collected near the northwest edge of the pond and SED-2 was collected near the middle of the pond. Both of these samples were collected using an Ekman grab.

The sediment samples, including two duplicates and two MS/MSD pairs, were analyzed by the CLP laboratory for VOCs; SVOCs; metals, including cyanide; pesticides; and PCBs. All sediment sampling procedures were conducted in accordance with PRC SOP No. 006, Sampling Sludge and Sediment (Appendix C). A discussion of sediment sampling analytical results is presented in Section 5.0.

3.8 TRENCHING

PRC contracted Columbia Building Services, Inc., of Minneapolis, Minnesota, to conduct trenching at the Pig's Eye site. The objective of the trenching was to visually identify the composition of the fill material. On October 12 and 13, 1994, Columbia Building Services, Inc., excavated four trenches, T-1 through T-4, each approximately 30 feet long, 3 feet wide, and 12 feet deep. The locations of the trenches are shown in Figure 3-6. PRC and MPCA personnel oversaw trenching activities. One soil sample was collected from each of trenches T-2 and T-3 and analyzed by the CLP laboratory for VOCs, SVOCs, metals including cyanide, and pesticides and PCBs.


MISSISSIPPI
RIVER
WOOD RECYCLING FACILITY
BATTLE CREEK
ASH DISPOSAL AREA
POND
BATTERY DISPOSAL AREA
DITCH
HWY 61
PIG'S EYE LAKE
LEGEND
SOIL GAS SAMPLING LOCATION
APPROXIMATE BOUNDARY OF FILL MATERIAL (BASED ON GEOPHYSICAL SURVEY)
SOURCE: MODIFIED FROM RAMSEY COUNTY GIS DATABASE MAP 1994
300' 0 300' 600'
SCALE: 1" = 600'
NOTE: GRID MEASURES 180' X 200'.
PIG'S EYE DUMP
ST. PAUL, MINNESOTA
FIGURE 3-1
SOIL GAS SURVEY LOCATIONS
PRC ENVIRONMENTAL MANAGEMENT, INC.


MISSISSIPPI
RIVER
WOOD RECYCLING FACILITY
BATTLE CREEK
ASH DISPOSAL AREA
POND
BATTERY DISPOSAL AREA
DITCH
HWY 61
PIG'S EYE LAKE
LEGEND
GEOPROBE™ GROUNDWATER SAMPLING LOCATION
APPROXIMATE BOUNDARY OF FILL MATERIAL (BASED ON GEOPHYSICAL SURVEY)
SOURCE: MODIFIED FROM RAMSEY COUNTY GIS DATABASE MAP 1994
300' 0 300' 600'
SCALE: 1" = 600'
NOTE: GRID MEASURES 180' X 200'.
PIG'S EYE DUMP
ST. PAUL, MINNESOTA
FIGURE 3-2
GEOPROBE™ GROUNDWATER SAMPLING LOCATIONS
PRC ENVIRONMENTAL MANAGEMENT, INC.

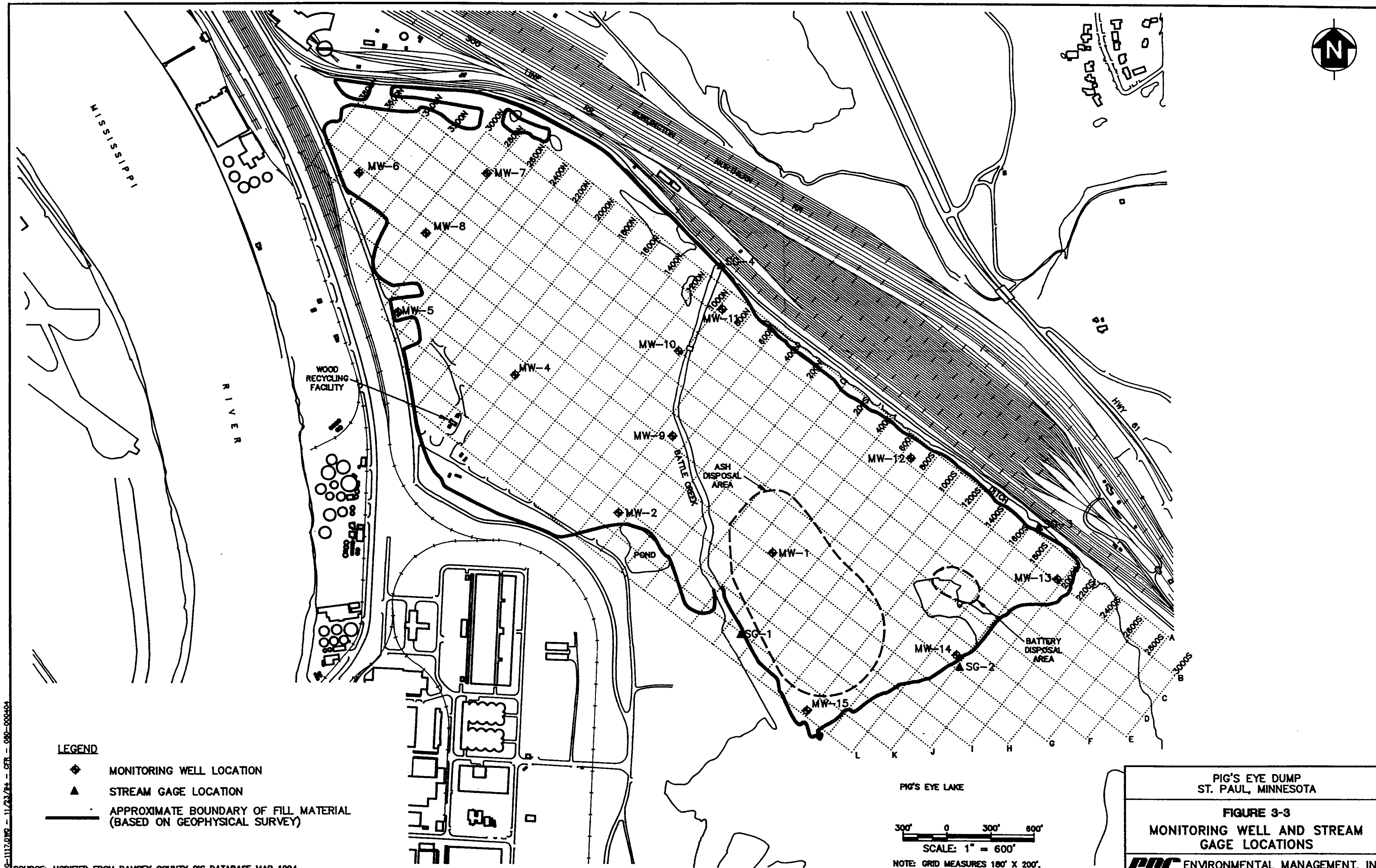


FIGURE 3-3
MONITORING WELL AND STREAM GAGE LOCATIONS

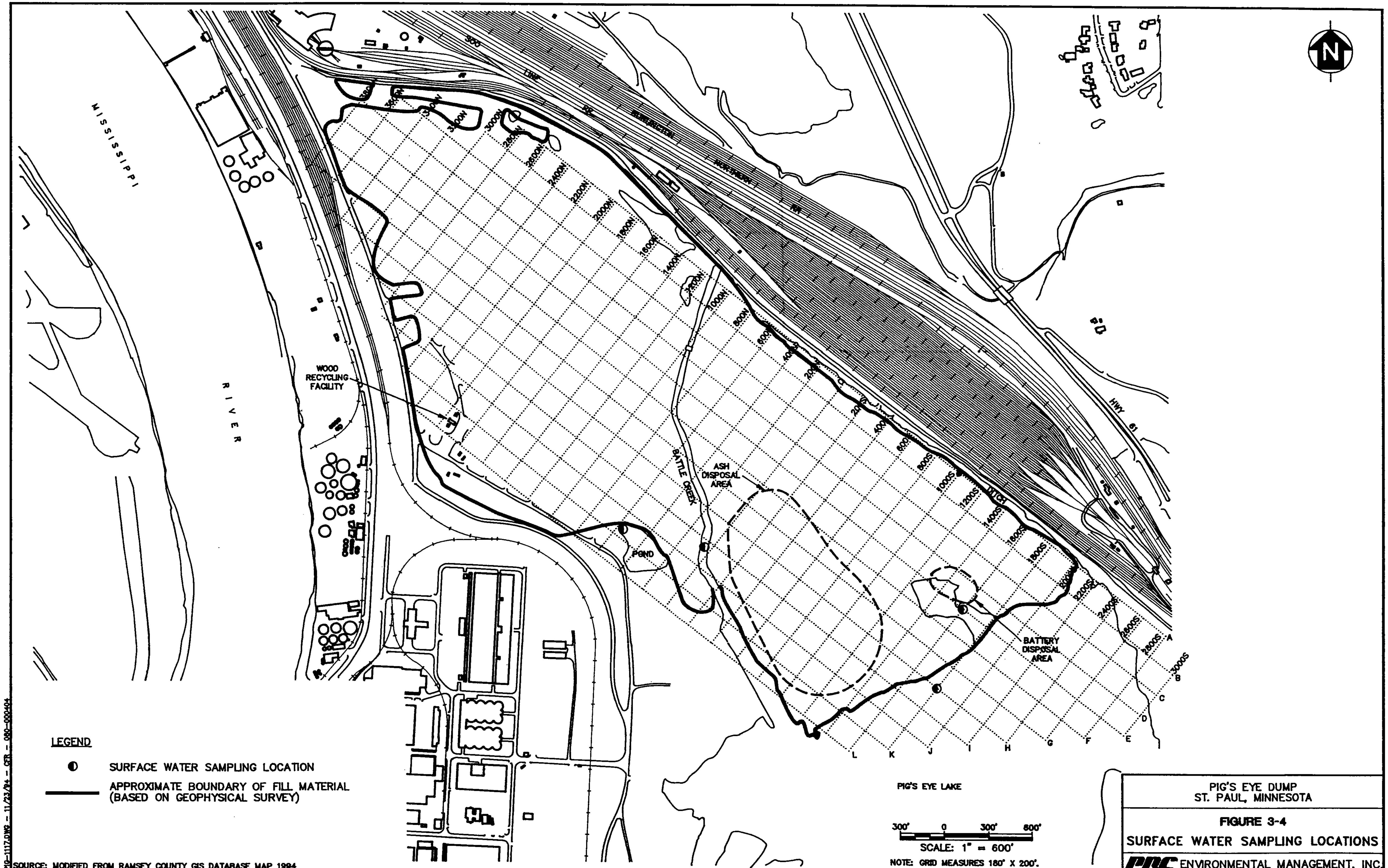
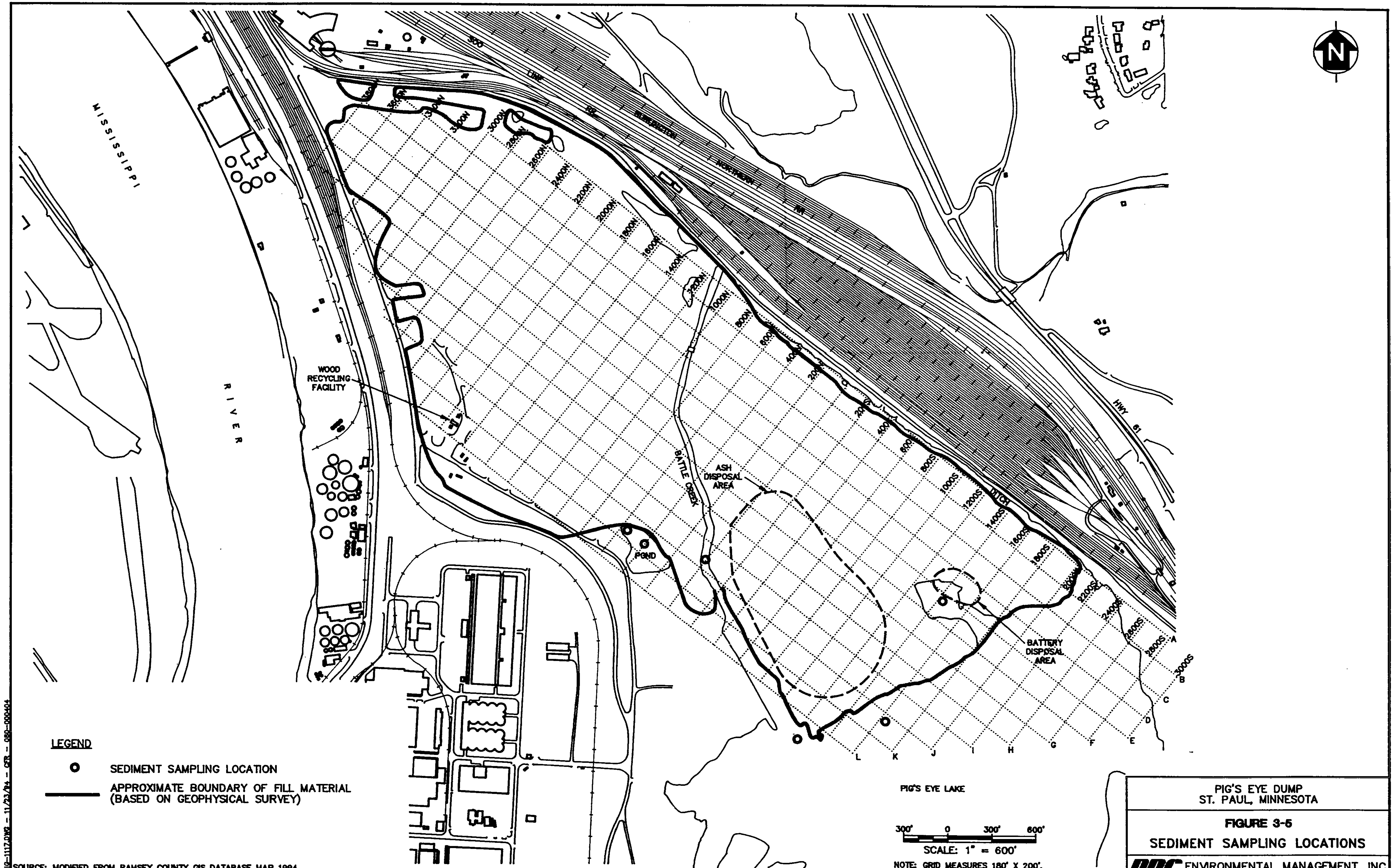


FIGURE 3-4
SURFACE WATER SAMPLING LOCATIONS


MISSISSIPPI
RIVER
WOOD RECYCLING FACILITY
ASH DISPOSAL AREA
BATTLE CREEK
POND
BATTERY DISPOSAL AREA
PIG'S EYE LAKE
HWY 61
DITCH
LEGEND
SEDIMENT SAMPLING LOCATION
APPROXIMATE BOUNDARY OF FILL MATERIAL (BASED ON GEOPHYSICAL SURVEY)
300' 0 300' 600'
SCALE: 1" = 600'
NOTE: GRID MEASURES 180' X 200'.
SOURCE: MODIFIED FROM RAMSEY COUNTY GIS DATABASE MAP 1994
PIG'S EYE DUMP
ST. PAUL, MINNESOTA
FIGURE 3-5
SEDIMENT SAMPLING LOCATIONS
PRC ENVIRONMENTAL MANAGEMENT, INC.

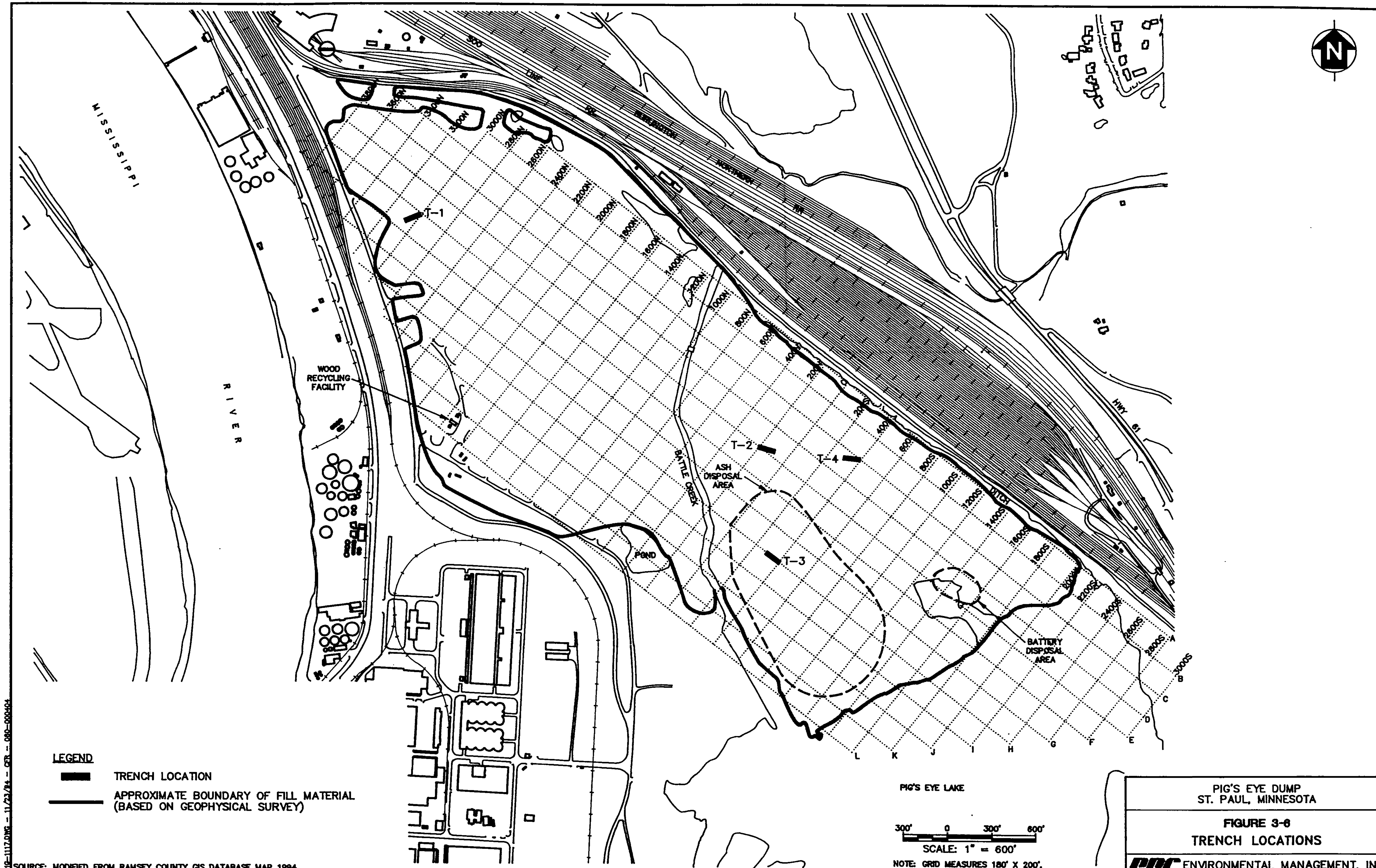

MISSISSIPPI
RIVER
N
T-1
T-2
T-3
T-4
WOOD RECYCLING FACILITY
ASH DISPOSAL AREA
BATTERY DISPOSAL AREA
BATTLE CREEK
POND
DITCH
HWY 61
PIG'S EYE LAKE
LEGEND
TRENCH LOCATION
APPROXIMATE BOUNDARY OF FILL MATERIAL (BASED ON GEOPHYSICAL SURVEY)
SOURCE: MODIFIED FROM RAMSEY COUNTY GIS DATABASE MAP 1994
300' 0 300' 600'
SCALE: 1" = 600'
NOTE: GRID MEASURES 180' X 200'.
PIG'S EYE DUMP
ST. PAUL, MINNESOTA
FIGURE 3-6
TRENCH LOCATIONS
PRC ENVIRONMENTAL MANAGEMENT, INC.
PIG-1117.DWG - 11/23/94 - CFR - 080-000404

TABLE 3-1

SOIL GAS SURVEY SAMPLING DEPTHS

Sample No.	Sampling Depth (feet bgs)
B-1000N	7.0
B-800N	7.0
B-600N	7.5
B-400N	7.5
B-200N	7.0
B-00	7.5
B-600S	7.5
B-800S	6.0
C-400N	7.5
C-200N	7.0
C-00	7.0
C-400S	5.0
C-600S	5.0
D-3600N	5.5
D-3400N	6.0
D-3200N	6.5
D-3000N	5.5
D-200N	7.0
D-00	6.0
D-200S	8.5
D-400S	8.5
D-600S	4.0
D-800S	3.0
D-1000S	4.5
D-1200S	4.0
D-1400S	4.0

Sample No.	Sampling Depth (feet bgs)
E-3800N	5.5
E-3000N	7.5
E-2600N	6.0
E-200N	7.5
E-00	6.0
E-200S	4.5
E-400S	7.0
E-600S	8.0
E-1000S	4.0
F-3600N	6.5
F-3200N	7.0
F-3000N	6.0
F-400S	7.0
F-600S	7.0
F-800S	6.0
F-1200S	NR[a]
G-3400N	6.5
G-3200N	5.0
G-00	7.5
G-200S	7.5
G-400S	7.5
G-600S	6.0
G-800S	6.0
G-1000S	6.0
G-1200S	5.5
G-1400S	3.0

TABLE 3-1 (Continued)

SOIL GAS SURVEY SAMPLING DEPTHS

Sample No.	Sampling Depth (feet bgs)
H-3000N	8.0
H-2600N	5.5
H-2200N	8.0
H-1800N	5.5
H-00	7.5
H-200S	7.5
H-400S	7.5
H-600S	7.5
H-800S	7.5
H-1000S	7.5
H-1200S	7.5
H-1400S	4.0
I-2800N	NR
I-2600N	7.0
I-2400N	4.0
I-2000N	7.0
I-1800N	7.0
I-1400N	NR
I-1200N	6.0
I-1000N	7.5
I-00	6.5
I-200S	7.5
I-400S	7.5
I-600S	7.5
I-800S	7.5
I-1000S	7.5

Sample No.	Sampling Depth (feet bgs)
I-1200S	7.5
I-1400S	7.0
J-2200S	5.5
J-2015N	5.5
J-1800N	7.0
J-1400N	7.0
J-1200N	9.5
J-1000N	9.0
J-800N	8.0
J-600S	7.0
J-800S	6.0
J-1000S	6.0
J-1200S	5.0
K-2200N	6.0
K-2000N	6.0
K-1800N	7.0
K-1600N	8.0
K-1400N	7.0
K-1200N	7.5
K-1000N	7.5
K-800N	6.0
L-2000N	5.5
L-1800N	7.0
L-1400N	7.0
L-1200N	7.0
L-1000N	5.5
L-800N	5.0

Note:

[a] NR = Not Recorded

TABLE 3-2

GEOPROBE™ GROUNDWATER SAMPLING DEPTHS

Sample No.	Sampling Interval (feet bgs)
A-800N	4.0 - 6.0
A-400N	NR[a]
B-2600N	10.0 - 12.0
B-1800N	10.0 - 12.0
B-1400N	7.0 - 9.0
B-00	10.0 - 12.0
B-400S	10.0 - 12.0
B-800S	7.0 - 9.0
B-1200S	9.5 - 11.5
B-1600S	9.5 - 11.5
B-2000S	NR
C-2200N	10.0 - 12.0
C-800N	13.0 - 15.0
C-400N	12.5 - 14.5
D-3600N	11.0 - 13.0
D-3000N	16.0 - 18.0
D-1400N	16.0 - 18.0
D-1600S	6.5 - 8.5
E-2600N	16.0 - 18.0
E-600N	7.0 - 9.0

Sample No.	Sampling Interval (feet bgs)
E-00	13.0 - 15.0
E-600S	7.0 - 9.0
E-1200S	7.5 - 9.5
F-3600N	9.5 - 11.5
F-3000N	12.5 - 14.5
F-2200N	12.5 - 14.5
F-1600N	13.0 - 15.0
F-1000N	8.0 - 10.0
F-1600S	6.5 - 8.5
H-2800N	11.0 - 13.0
H-600N	5.0 - 7.0
H-1600S	6.5 - 8.5
I-1200N	11.5 - 13.5
I-00	8.0 - 10.5
J-800N	7.0 - 9.0
J-600S	10.5 - 12.5
J-1400S	6.5 - 8.5
J-2400N	15.5-17.5
K-1600N	14.0 - 16.0
L-1200N	9.0 - 11.0

Note:

[a] NR = Not Recorded

4.0 PHYSICAL SETTING

This section presents local and regional information about the physical setting of the Pig's Eye site from published literature and the results of field investigation activities conducted during the LRI. The following physical characteristics were assessed to evaluate current site conditions and to assist in the determination of the need for additional remedial investigation activities:

- Population and land use
- Physiography
- Climate
- Soil types
- Geology
- Hydrogeology

The sections below contain detailed discussions of the results of the LRI study.

4.1 POPULATION AND LAND USE

The Pig's Eye site is located 3 miles southeast of downtown St. Paul in Ramsey County, Minnesota (see Figure 4-1). The site is mostly vacant land bordered by industrial property to the north and west. The nearest residential area is east of the site on the bluffs overlooking the Mississippi River valley. Railroad facilities and tracks owned by Soo Line and Canadian Pacific are located north and east of the site, and Burlington Northern railroad facilities and tracks and numerous industrial facilities are located west of the site along the Mississippi River. A wood recycling facility owned by the City of St. Paul is located in the southwest portion of the site. Pig's Eye Lake borders the southern end of the site.

The Pig's Eye site is part of a diverse ecological system. The site is located within the boundaries of the Mississippi National River and Recreation Area and within habitats of the bald eagle and peregrine falcon. A heron rookery managed by the Minnesota Department of Natural Resources (MDNR) is located along the western shore of Pig's Eye Lake south of the site. Pig's Eye Lake recreational park is located south of the site. The population density of Ramsey County is estimated at 3,117.9 people per square mile (Bureau of Census 1990). About 40,000 people are located within a 4-mile radius of the Pig's Eye site (MPCA 1989).

4.2 PHYSIOGRAPHY

The Pig's Eye site is located within the Mississippi Bottomland geomorphic region of the Mississippi River lowland (Patterson 1992; see Figure 4-2). This geomorphic region is typically flat and resulted from postglacial deposition of slackwater sediments in flood plains of the Mississippi River.

The Mississippi River is located about 0.5 mile west of the Pig's Eye site. Most of the Pig's Eye site lies within the 50-year flood plain of the Mississippi River, and the southeastern portion of the site lies within the 10-year flood plain. The 50-year and 10-year flood plain elevations are at 704 and 699 feet above mean sea level (MSL), respectively. The elevation of the Pig's Eye site ranges from 687 to about 705 feet above MSL. The slope between the site and the Mississippi River is less than 1 percent in all directions.

Several perennial surface water bodies are present throughout the site. Battle Creek flows generally north to south through the site and empties into Pig's Eye Lake. As a result of dumping, the original course of Battle Creek was altered to its present course. An unnamed pond is present in the southwestern portion of the site, and an unnamed drainage ditch parallels the eastern boundary of the site next to Soo Line railroad property. This drainage ditch empties into Pig's Eye Lake from the east. Pig's Eye Lake itself borders the site to the south. Numerous other small water bodies with areas of typically less than 1 acre are also located on site.

4.3 CLIMATE

The information in this section was derived from the *Soil Survey of Washington and Ramsey Counties, Minnesota* (USDA 1980). In the Minneapolis and St. Paul area, winters are cold, and the summers tend to be short and warm. The prevailing wind direction is from the northwest. The average wind speed is 12 miles per hour and is highest in April. The percentage of sunshine is 67 percent in the summer and 50 percent in the winter.

The average temperature in winter is 17 °F, and the average daily minimum temperature is 8 °F. The average summer temperature is 70 °F, and the average daily maximum temperature is 80 °F. Temperature extremes range from 97 °F to -35 °F.

Precipitation is distributed relatively evenly throughout the year and peaks in the summer months. The average total annual precipitation is 29 inches, 71 percent of which falls from April through September. Snow covers the ground from late fall through early spring. The average seasonal snowfall is 46 inches. Soils typically freeze to a depth of 1 to several feet bgs, depending on the amount of snow cover.

4.4 SOIL TYPES

The information in this section was derived from the *Soil Survey of Washington and Ramsey Counties, Minnesota* (USDA 1980). Soils in the vicinity of the Pig's Eye site consist mainly of the Udorthent, wet substratum-Algansee complex. Figure 4-3 represents the soil types present in Ramsey County. The Udorthent, wet substratum soils are nearly level to very gently sloping. The texture and composition of the soils vary but generally reflect the characteristics of nearby soils. Much of the soil is mixed with fill material at the Pig's Eye site and with other material dredged from the Mississippi River.

Algansee soils are poorly drained, nearly level, coarse textured soils. The surface layer is usually dark loamy sand underlain by mottled sands, indicating sluggish water movement. The Udorthent, wet substratum-Algansee complex soils have slopes from 0 to 4 percent. These soils are also highly susceptible to flooding and have a high seasonal water table.

4.5 GEOLOGY

Regional geologic data were obtained from published maps and reports. Site-specific stratigraphic and hydrogeologic data were obtained from detailed geologic logs of monitoring well borings. Regional and site-specific geology are discussed below.

4.5.1 Regional Geology

Most of the Minneapolis and St. Paul area is covered with unconsolidated glacial deposits directly overlying bedrock. The glacial deposits generally consist of those deposited directly by an active ice mass and those deposited by melt water discharging from the ice mass. Glacial debris deposited directly at or under the active ice margin is broadly referred to as "till," an unsorted mixture of clay, silt, sand, and gravel. Material deposited by flowing melt water discharging from the ice mass is referred to as "outwash" and consists of sorted and stratified sand and gravel. Other englacial and proglacial deposits such as lake deposits, eskers, and debris flows are also common. The unconsolidated glacial material in the Minneapolis and St. Paul area ranges in thickness from 0 to about 400 feet depending on the depth to the eroded bedrock surface.

Bedrock that underlies the unconsolidated deposits in the Minneapolis and St. Paul area is comprised of Paleozoic Era strata of the Late Cambrian and Early to Middle Ordovician ages. Figure 4-4 represents a stratigraphic column of southeastern Minnesota.

Bedrock underlying the glacial deposits in the Minneapolis and St. Paul area, from the oldest to youngest, is composed of the Late Cambrian age St. Lawrence Formation; the Late Cambrian age Jordan Sandstone; the Early Ordovician age Prairie du Chien Group; the Middle Ordovician age St. Peter Sandstone; the Middle Ordovician age Glenwood and Platteville Formations; and the Middle Ordovician age Decorah Shale. Older strata, such as the St. Lawrence Formation and Jordan Sandstone, subcrop beneath buried valleys where erosion has removed younger strata. The bedrock geology of Ramsey County is presented in Figure 4-5.

Jordan Sandstone ranges from fine-grained, feldspathic sandstone in its lower portion to medium- to coarse-grained quartz sandstone in its upper portion. It is underlain by the St. Lawrence Formation, a dolomitic shale and siltstone, and has a sharp upper contact with the overlying Prairie du Chien Group. The Jordan Sandstone does not outcrop in the Minneapolis and St. Paul area, but it does subcrop beneath Quaternary Period deposits, particularly in some of the deeper buried valleys. The Jordan Sandstone has an maximum thickness of 115 feet in the Minneapolis and St. Paul area (Mossler 1987).

The Prairie du Chien Group consists of medium to massive bedded dolostone at its base and grades upward into a thinbedded, sandy and oolitic dolostone. Thin beds of sandstone and chert are also common in its upper portion. No outcrops of the Prairie du Chien Group are present in the region, but it is the first bedrock unit encountered beneath Quaternary Period deposits over much of the Minneapolis and St. Paul area. The Prairie du Chien Group is 100 to 300 feet thick (Mossler 1987).

The St. Peter Sandstone is massive, fine- to medium-grained, well rounded, well sorted quartz sandstone. Mudstone and siltstone beds, some of which are laterally extensive across the region and can be identified through geophysical logs, are present at the base of the St. Peter Sandstone. The basal contact with the Prairie du Chien Group is a regionally extensive unconformity. The St. Peter Sandstone crops out in bluffs along the Mississippi River and other dissected river valleys in the region. The St. Peter Sandstone averages 155 feet thick in the Minneapolis and St. Paul area (Mossler 1987).

The Glenwood Formation is brownish gray, calcareous, sandy, phosphatic shale with a characteristic blocky fracture pattern. Phosphate nodules are as large as 1 inch in diameter. The Glenwood Formation has a maximum thickness in the Minneapolis and St. Paul area of 16 feet. (Mossler 1987)

The Platteville Formation is generally gray, thin-bedded, dolostone and dolomitic limestone with thin shale and sandstone interbeds. The contact with the underlying Glenwood Formation is a well defined, sharp contact with carbonate overlying shale. The maximum thickness of the Platteville Formation in the Minneapolis and St. Paul area is about 30 feet (Mossler 1987).

Decorah Shale is typically grayish green, fossiliferous shale with thin limestone interbeds. Its underlying contact with the Platteville Formation is gradational. The Decorah Shale attains a maximum thickness of 80 feet in the Minneapolis and St. Paul area (Mossler 1987).

4.5.2 Site-Specific Geology

The Pig's Eye site is underlain by 30 to more than 200 feet of Late Wisconsinan- to Holocene-aged unconsolidated deposits. These deposits consist mostly of melt water sands and gravel that filled the Phalen Channel, the precursor to the modern Mississippi River (Mossler and Cleland 1992). As the glaciers began their final retreat from the Minneapolis and St. Paul area, the Phalen Channel was eroded to great depths and formed the major drainage pathway for meltwater. As the ice mass continued its retreat northwest, the Phalen Channel was eventually cut off by the modern Mississippi River channel (Mossler and Cleland 1992). This new channel flowed on the west side of the bedrock high, on which MWCC's wastewater treatment facility is now located. The western part of the Pig's Eye site lies east of this bedrock high in the center of the buried Phalen Channel. After avulsion of the old Phalen Channel, the Pig's Eye site became a backwater slough of the Mississippi River and filled up with slackwater sediments and organic deposits.

The upper part of these sediments consists of recent deposits of sands, silts, clays, and organic material. According to bedrock maps of the region, bedrock underlying the central portion of Pig's Eye site is Jordan Sandstone (Mossler and Bloomgren 1992). Based on detailed descriptions of the unconsolidated sediments and bedrock encountered during field activities, the following units, from highest to lowest, have been defined at the Pig's Eye site:

- Fill material consisting of thin to absent soil cover and dump debris
- Organic silt and peat consisting of dark brown to black, clayey silt with a high content of organic matter
- Sand consisting of moist to saturated, light to dark gray, fine- to very coarse-grained sand with silty and clayey layers
- Bedrock consisting of gray and red, brecciated, sandy dolomite with vuggy porosity

The vertical and lateral stratigraphic relationships of these units are shown in the cross sections indexed by Figure 4-6. The generalized cross sections themselves are shown in Figures 4-7 and 4-8. These cross sections were constructed from site specific boring logs, which are presented in Appendix D. Information on actual subsurface conditions is available only at specific soil boring locations.

The lowermost unit encountered at the site is the upper weathered portion of the Prairie du Chien Group. Deeper in the buried Phalen Channel under the western part of the site, the Prairie du Chien Group has probably been removed, and Jordan Sandstone is most likely subcropping beneath the glacial deposits. The only monitoring well at which bedrock was encountered is monitoring well

MW-14. Here, the Prairie du Chien Group was encountered at 27 feet bgs. Fragments of bedrock collected in a split-spoon sample indicate a red, brecciated, sandy dolomite with abundant vuggy porosity. At monitoring well MW-15, bedrock was not encountered, indicating that the deeper part of the buried Phalen Channel may be under monitoring well MW-15. The boring for monitoring well MW-15 was ended at 52 feet bgs. According to geologic maps of Ramsey County, bedrock underlying the deeper parts of the channel probably consists of Jordan Sandstone (Mossler and Bloomgren 1992).

The unconsolidated sand unit directly overlies the bedrock and ranges from 5 to possibly more than 200 feet in thickness according to bedrock topographic maps of the region (Mossler 1992). It is a gray, moderately sorted, subangular to subrounded, fine- to very coarse-grained sand unit. In deep monitoring well MW-15, three fining-upward sequences were identified within the sand unit. Three clayey layers between 2 and 8 inches thick, are intercalated within the sand units at the tops of the fining-upward sequences. The clay layers contain organic material and probably represent lacustrine deposition during damming of the Phalen Channel. The clay layers are probably laterally extensive within the buried valley and most likely pinch out toward the valley walls. The sand unit also contains gastropod shells and small clam shells.

The organic silt and peat unit directly overlies the sand unit and varies in thickness across the site. It appears to be absent in the much of the northwest portion of the site and is present in all monitoring well boreholes southeast of Battle Creek. The unit is dry to moist and has a thickness of 2 to 20 feet, with a maximum thickness in the vicinity of monitoring well MW-14.

Fill material varies from approximately 5 to 15 feet in thickness and consists of construction debris and mixed household and industrial wastes. Plastic, cellophane, paper, and metal products were abundant in much of the well cuttings and trenching debris. Visual observation of the fill material indicated little or no degradation.

4.6 HYDROGEOLOGY

Regional and site-specific hydrogeology information pertinent to the Pig's Eye site LRI are presented in the sections below.

4.6.1 Regional Hydrogeology

Major sources of groundwater in the Minneapolis and St. Paul area include the Mt. Simon Aquifer, the Prairie du Chien-Jordan Aquifer, and thick sequences of unconsolidated sand and gravel in the buried valleys. The St. Peter Aquifer and the Franconia-Ironton-Galesville Aquifer are also sources of groundwater in the area. The principal source of groundwater in the region is the Prairie du Chien-Jordan Aquifer. About 210 residential wells are located within a 3-mile radius of the Pig's Eye site (MPCA 1989). Some of the municipal water supplies, however, use the Mississippi River as a source of drinking water.

The Mt. Simon Aquifer underlies all of Ramsey County. Limited groundwater elevation data show that the groundwater movement of the Mt. Simon Aquifer differs from that of overlying aquifers. The Mt. Simon Aquifer appears to flow east to west toward heavy pumping areas in Hennepin County. The Mt. Simon Aquifer is not hydraulically connected to the shallow groundwater system or to major waterways. Groundwater in the Mt. Simon Aquifer is derived from leakage from overlying units or from recharge outside Ramsey County (Kanivetsky and Cleland 1992).

The Franconia-Ironton-Galesville Aquifer underlies all of Ramsey County. Groundwater moves from areas of high hydraulic head in northern Ramsey County toward the Mississippi River. The Franconia-Ironton-Galesville Aquifer is separated from the underlying Mt. Simon Aquifer by the Eau Claire Confining Unit (Kanivetsky and Cleland 1992).

The Prairie du Chien-Jordan Aquifer is the most heavily used aquifer in the county. This aquifer is present throughout Ramsey County except in deeper parts of bedrock valleys. Groundwater movement in the Prairie du Chien Group occurs mainly through fractures, joints, and solution cavities, whereas groundwater movement in the Jordan Sandstone is through intergranular pore space. The Prairie du Chien Group and the Jordan Sandstone function as a single aquifer because of the absence of a regionally extensive confining unit. Groundwater flows from areas of high hydraulic head in northern Ramsey County toward the Mississippi River. The Prairie du Chien-Jordan Aquifer is mostly confined throughout the county except just south of the Pig's Eye site. The Prairie du Chien-Jordan Aquifer is highly prolific in the region, with yields as high as 2,000 gallons per minute (gpm). The Prairie du Chien-Jordan Aquifer is separated from the underlying Franconia-Ironton-Galesville Aquifer by the St. Lawrence Confining Unit (Kanivetsky and Cleland 1992).

The St. Peter Aquifer underlies about 75 percent of Ramsey County. It is absent in northwestern Ramsey County and in deeper bedrock valleys such as the one underlying the Pig's Eye site. Groundwater in the St. Peter Aquifer flows from areas of high hydraulic head in northern Ramsey County toward the Mississippi River. Regionally extensive mudstone and siltstone beds at the base of the St. Peter Aquifer act as confining units between the St. Peter Aquifer and the underlying Prairie du Chien-Jordan Aquifer (Kanivetsky and Cleland 1992).

Groundwater from the Glenwood, Platteville, and Galena Formations are rarely used as sources of drinking water in the Minneapolis and St. Paul area (Kanivetsky and Cleland 1992).

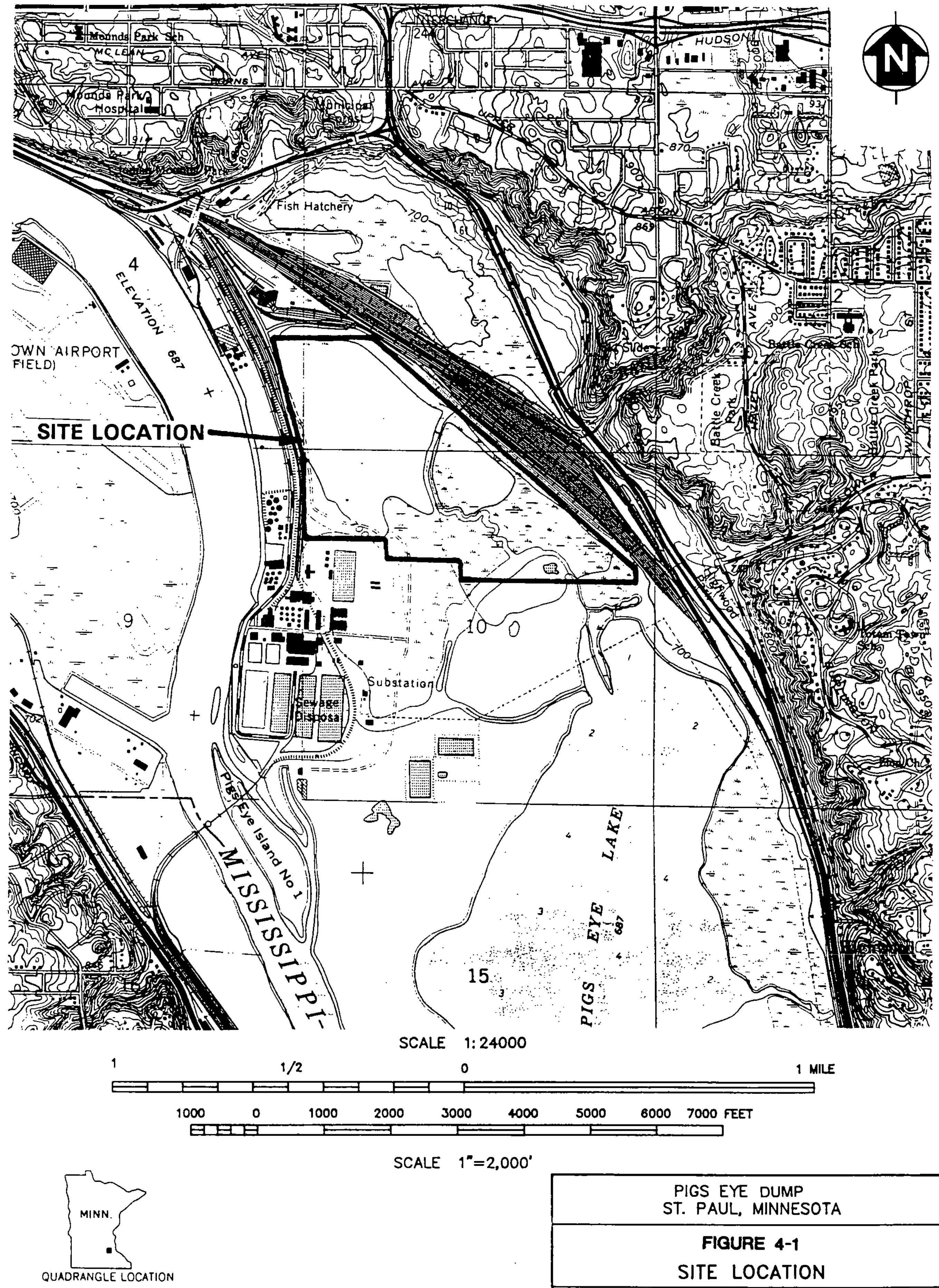
4.6.2 Site-Specific Hydrogeology

Two shallow water-bearing units were identified at the Pig's Eye site during monitoring well installation. An upper, unconfined unit is present at the interface of the fill material and the organic silt and peat unit. A deeper confined or semiconfined unit is present in the sand unit below the organic silt and peat unit. Although well nests were not installed during the LRI, it appears that the organic silt and peat unit acts as a local confining unit southeast of Battle Creek, especially at monitoring well MW-14. During soil boring drilling at monitoring well MW-14, two separate water-bearing units were encountered above and below the organic silt and peat unit. Both of these water-bearing units, however, are considered part of the larger unconsolidated valley fill aquifer that fills the buried Phalen Channel. Because the sand unit lies directly over bedrock, the shallow water-bearing units below the site are also in direct hydrogeologic contact with the underlying Prairie du Chien-Jordan Aquifer.

Groundwater from the Prairie du Chien-Jordan Aquifer is the principal source of private drinking water in the area around the Pig's Eye site. Although the unconsolidated deposits along the Mississippi River are capable of high yields, they typically are not used for drinking water supplies.

Groundwater elevation data were collected for the monitoring wells at the Pig's Eye site on September 14, October 4, and October 15, 1994 (see Tables 4-1, 4-2, and 4-3). Stream gage measurements were recorded on October 15, 1994 (see Table 4-4). Figures 4-9, 4-10, and 4-11 present the groundwater elevation data collected on September 14, October 4, and October 15, 1994, and approximate groundwater contours. The figures indicate that a mounding effect is present both northwest and southeast of Battle Creek. Battle Creek also acts as a discharge point for shallow groundwater at the site. Northwest of Battle Creek, groundwater also appears to flow toward the Mississippi River.

Monitoring wells MW-14 and MW-15 have lower groundwater elevations than nearby shallow monitoring wells screened above the organic silt and peat unit. This indicates that a downward vertical hydraulic gradient exists between the water-bearing units above and below the organic silt and peat units. Additional hydrogeological data, such as installation of monitoring well nests, would verify this assumption.



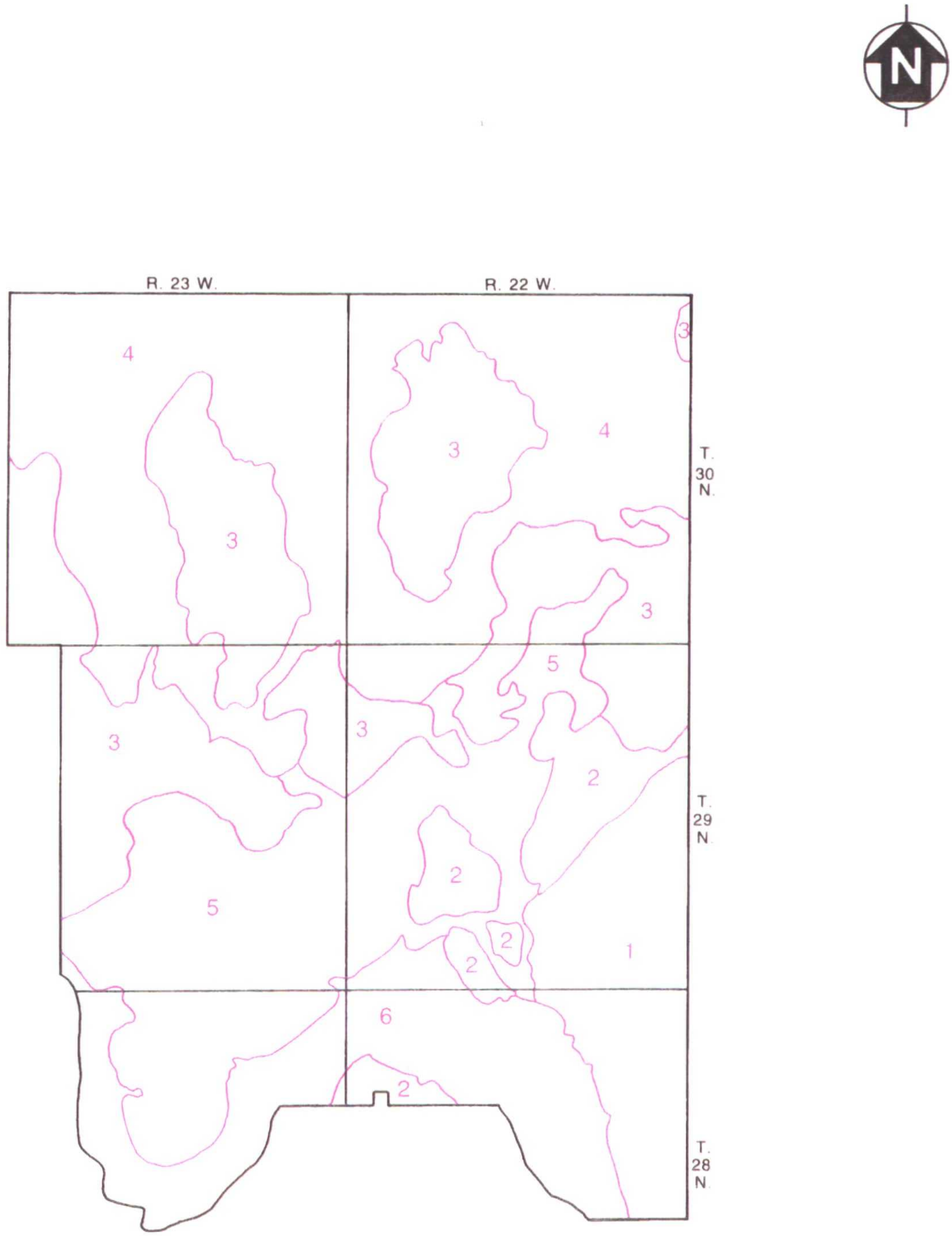
SOURCE: MODIFIED FROM USGS, ST. PAUL EAST QUADRANGLE, 1993

PIGS EYE DUMP
ST. PAUL, MINNESOTA

FIGURE 4-1

SITE LOCATION

PRC ENVIRONMENTAL MANAGEMENT, INC.



LEGEND

1 ST. CROIX MORAINE COMPLEX
2 ST. PAUL TILL PLAIN
3 NORTH RAMSEY MOUNDS
4 ANOKA SAND PLAIN
5 ST. PAUL SAND FLATS
6 MISSISSIPPI BOTTOMLAND

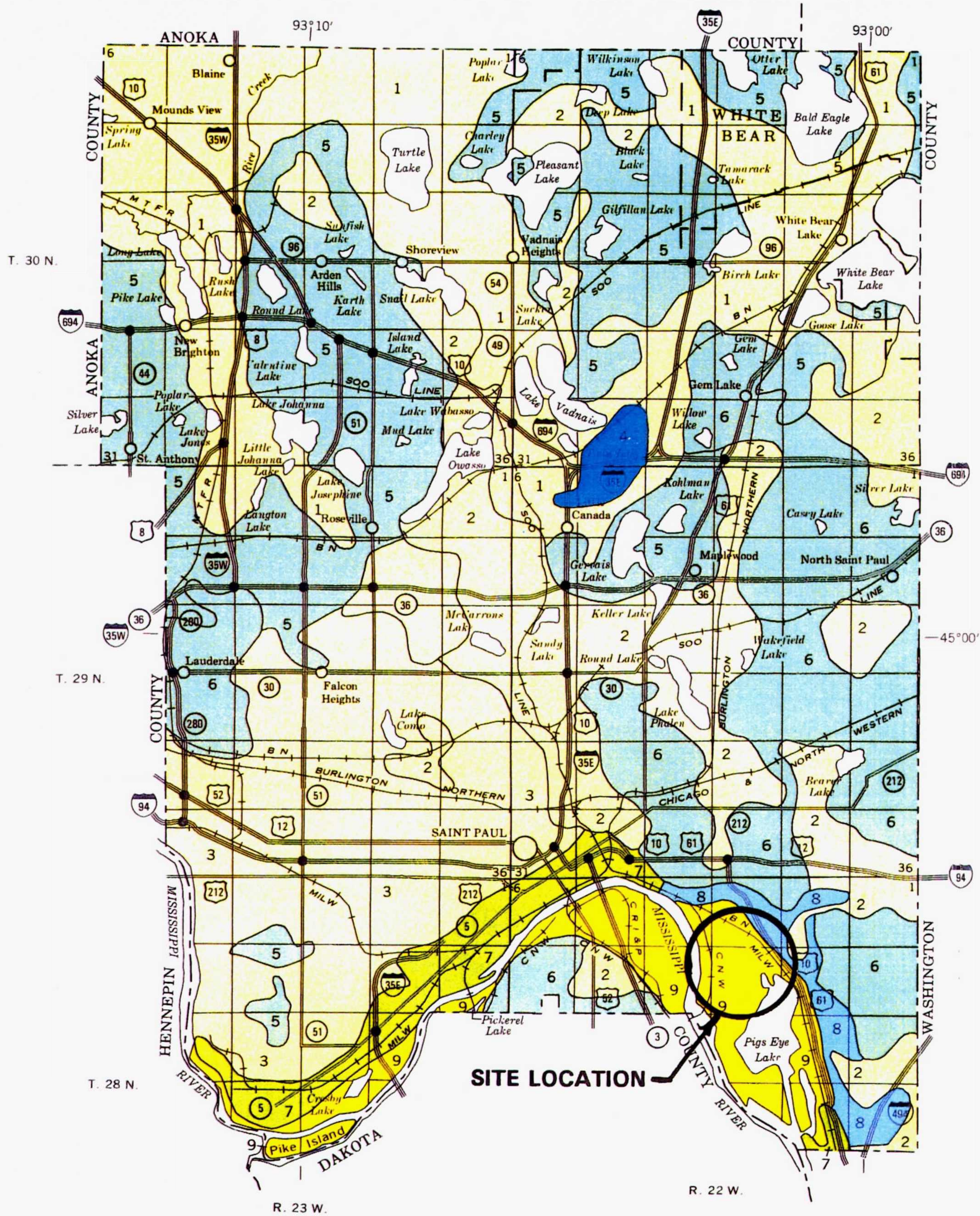
NOT TO SCALE

SOURCE: MODIFIED FROM PATTERSON 1992

PIG'S EYE DUMP
ST. PAUL, MINNESOTA

FIGURE 4-2
GEOMORPHIC REGIONS OF RAMSEY COUNTY

PRC ENVIRONMENTAL MANAGEMENT, INC.



SOURCE: MODIFIED FROM USDA 1980

SOIL LEGEND*

SOILS FORMED DOMINANTLY IN OUTWASH

1 — Zimmerman–Urban Land–Rifle: Level to gently rolling, excessively drained and very poorly drained, coarse textured soils and organic soils and Urban land; on uplands

2 — Urban Land–Chetek–Mahtomedi: Urban land and nearly level to very steep, somewhat excessively drained and excessively drained, moderately coarse textured and coarse textured soils; on uplands

3 — Urban Land–Waukegan–Chetek: Urban land and nearly level to moderately steep, well drained and somewhat excessively drained, medium textured and moderately coarse textured soils; on uplands

SOILS FORMED DOMINANTLY IN LACUSTRINE SEDIMENTS

4 — Barronett–Grays: Level to gently sloping, poorly drained and moderately well drained, medium textured soils; on glacial lake plains

SOILS FORMED DOMINANTLY IN GLACIAL TILL

5 — Hayden–Urban Land: Undulating to steep, well drained, moderately coarse textured soils and Urban land; on uplands

6 — Kingsley–Urban Land: Undulating to steep, well drained, moderately coarse textured soils and Urban land; on uplands

SOILS FORMED DOMINANTLY IN LOAMY SEDIMENTS OVER BEDROCK

7 — Urban Land–Copaston: Urban land and level to moderately sloping, well drained, medium textured soils; on uplands

SOILS FORMED DOMINANTLY IN GLACIAL TILL OR OUTWASH

8 — Kingsley–Mahtomedi: Undulating to very steep, well drained and excessively drained, moderately coarse textured and coarse textured soils; on uplands

SOILS FORMED DOMINANTLY IN RECENT ALLUVIUM

9 — Udorthents, wet substratum–Algansee: Nearly level to very gently sloping, variably textured fill material and nearly level, somewhat poorly drained, coarse textured soils; on flood plains

Compiled 1978

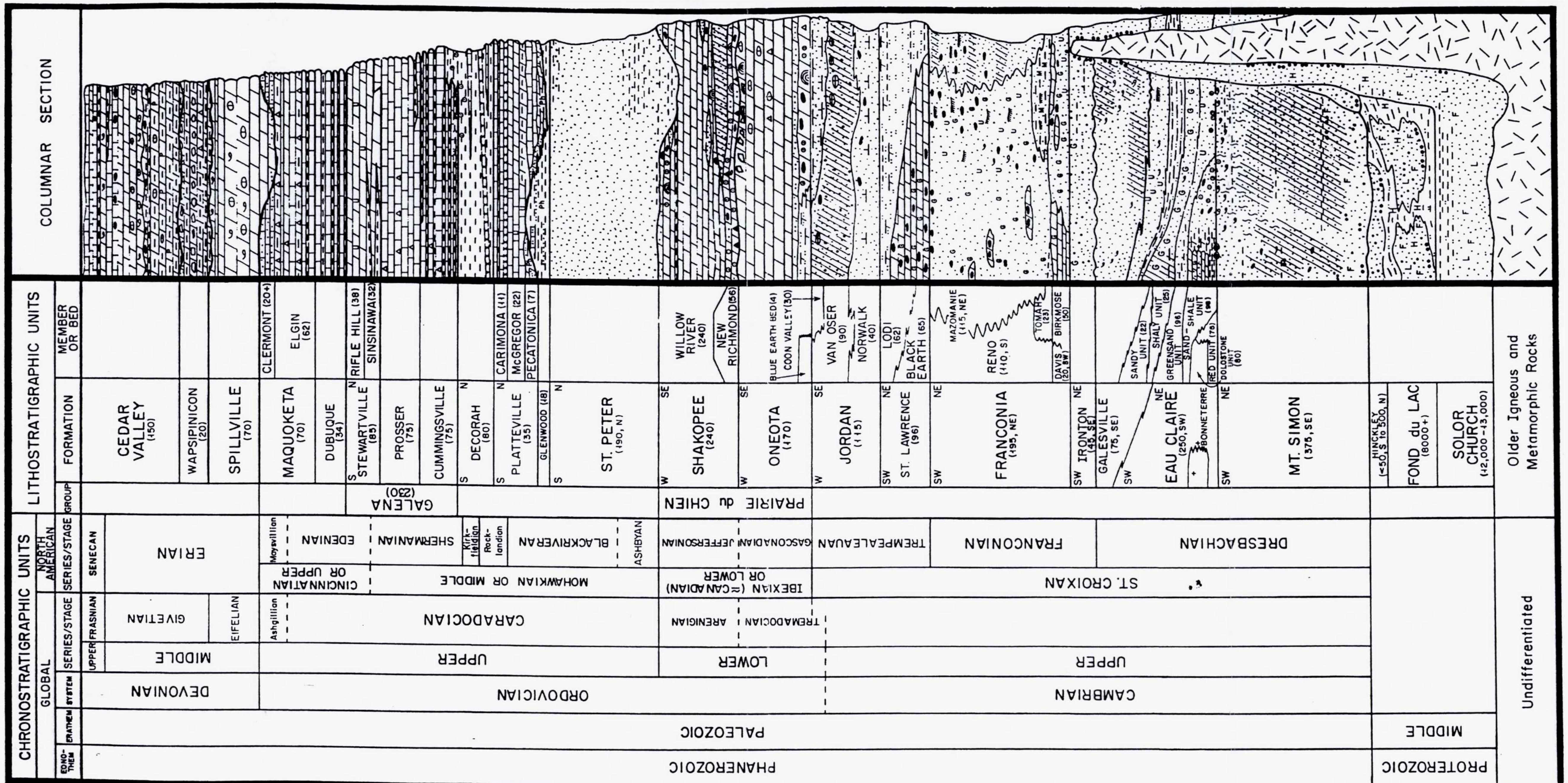
* Terms describing texture refer to the surface layer of the major soils in each map unit.

1 0 1 2 MILES
APPROXIMATE SCALE IN MILES

PIG'S EYE DUMP
ST. PAUL, MINNESOTA

FIGURE 4-3
SOIL MAP OF RAMSEY COUNTY

PRC ENVIRONMENTAL MANAGEMENT, INC.



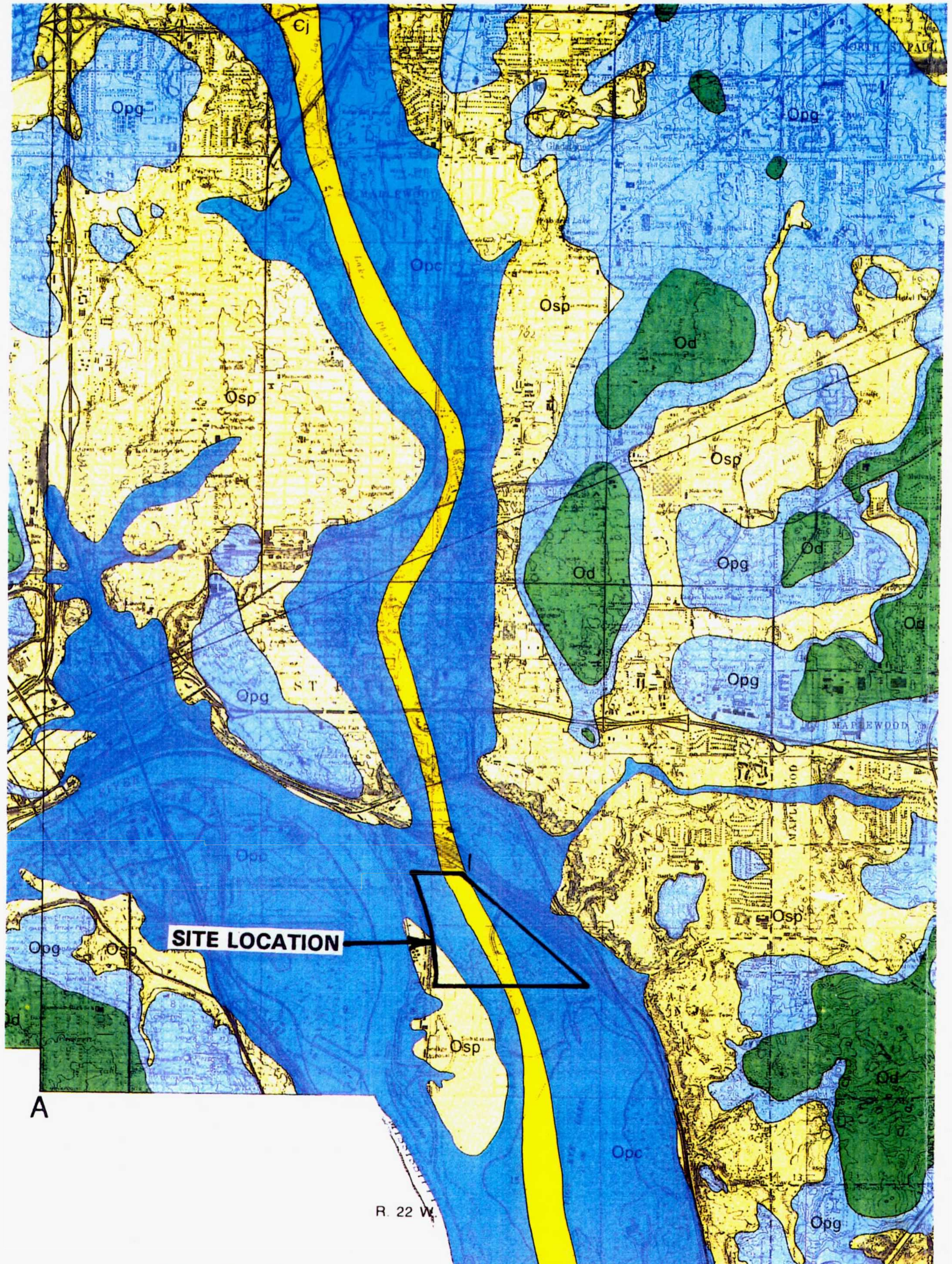
SOURCE: MODIFIED FROM MOSSLER 1987

PIG'S EYE DUMP
ST. PAUL, MINNESOTA

FIGURE 4-4

STRATIGRAHIC COLUMN OF SOUTHEASTERN MINNESOTA

PRC ENVIRONMENTAL MANAGEMENT, INC.



SOURCE: MODIFIED FROM MOSSLER AND BLOOMGREN 1992

DESCRIPTION OF BEDROCK UNITS

Od — **Decorah Shale**—Green, calcareous shale; thin limestone interbeds. In a few places capped by thin (less than 20 feet) erosional remnants of limestone of overlying Galena Group (not shown on map). Largely restricted to south half of county. Unit crops out in bluffs of Mississippi River in south and west St. Paul. Formerly mined in south St. Paul above Pickerel Lake for clay to make brick and tile.

Opg — **Platteville and Glenwood Formations**—Fine-grained dolostone and limestone of Platteville underlain by thin, green, sandy shale (3–5.5 feet thick) of Glenwood. Extensive outcrops in bluffs along Mississippi River in St. Paul. Platteville formerly quarried for rock aggregate and building stone in bedrock terraces of south St. Paul.

Osp — **St. Peter Sandstone**—Upper half to two-thirds: fine- to medium-grained, quartz sandstone; generally massive to thick bedded. Lower part: multicolored beds of mudstone, siltstone, and shale; interbeds of very coarse sandstone. Basal contact is erosional surface. Unit crops out in bluffs along Mississippi River. Formerly mined for glass sand for the Ford Motor Company plant in west St. Paul. Man-made caves in St. Peter, within the bluffs along Mississippi River in south St. Paul, formerly used for raising mushrooms.

Opc — **Prairie du Chien Group**—Upper half to two-thirds: commonly sandy or oolitic and thin-bedded dolostone; thin beds of sandstone and chert; thin beds of intraclastic (conglomeratic) dolostone. Lower part: generally massive or thick bedded dolostone; not oolitic or sandy, except for thin, sandy, transitional zone at base. Upper part of Prairie du Chien dolostone may contain karst solution cavities, particularly where overlying St. Peter Sandstone removed by erosion. No outcrops of Prairie du Chien Group in county; however, it is first bedrock encountered beneath Quaternary deposits over large part of county; extensive outcrops found in adjacent northern Dakota and southern Washington Counties.

Cj — **Jordan Sandstone**—Upper part: medium- to coarse-grained, friable, quartzose sandstone. Lower part: primarily fine-grained, feldspathic sandstone. Sharp upper contact with Prairie du Chien Group. No outcrops of Jordan in county; subcrops beneath Quaternary deposits along some buried valleys.

½ 0 ½ 1 MILE
APPROXIMATE SCALE IN MILES

PIG'S EYE DUMP
ST. PAUL, MINNESOTA

FIGURE 4-5
BEDROCK GEOLOGY OF RAMSEY COUNTY

PRC ENVIRONMENTAL MANAGEMENT, INC.

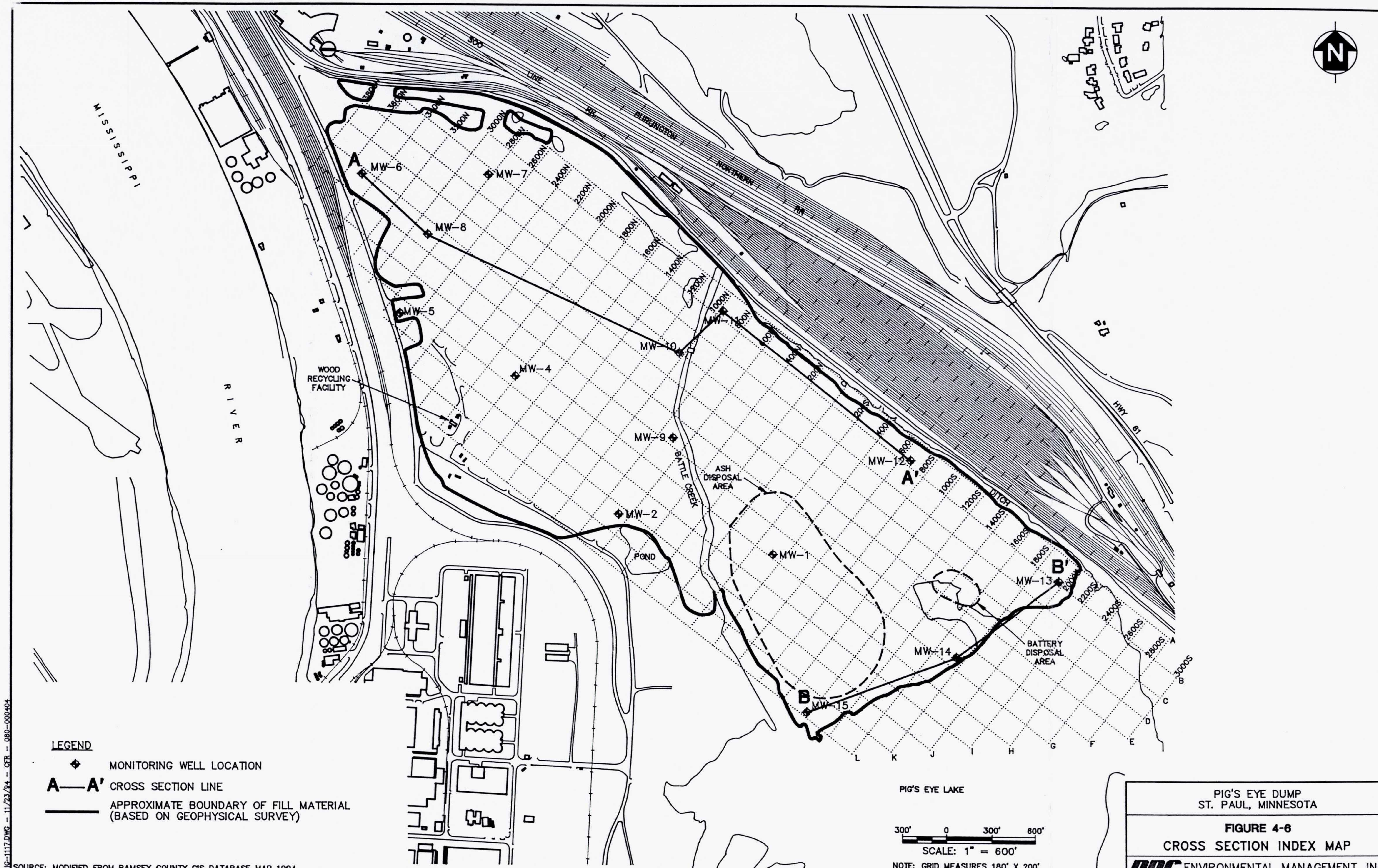
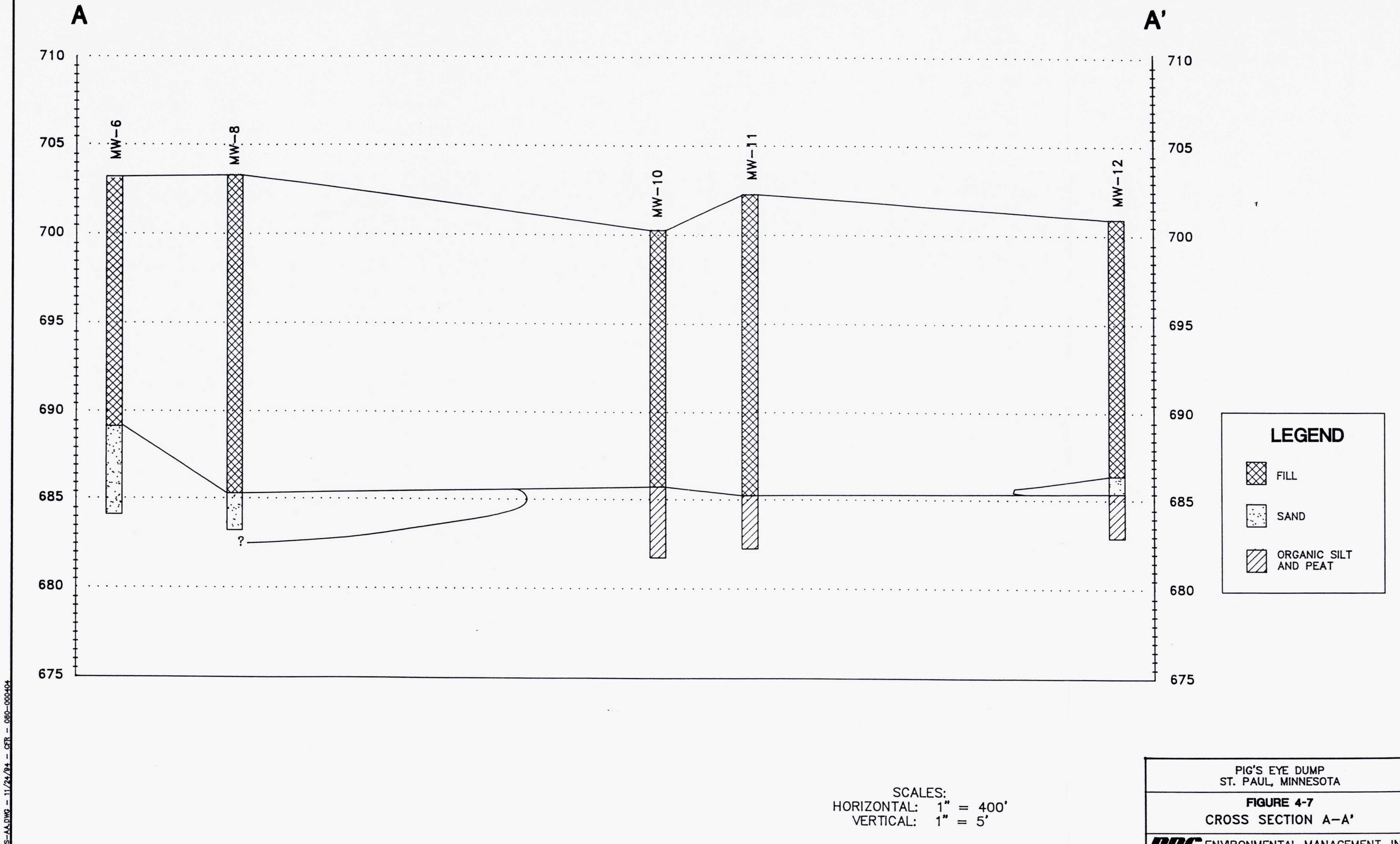


FIGURE 4-6
CROSS SECTION INDEX MAP

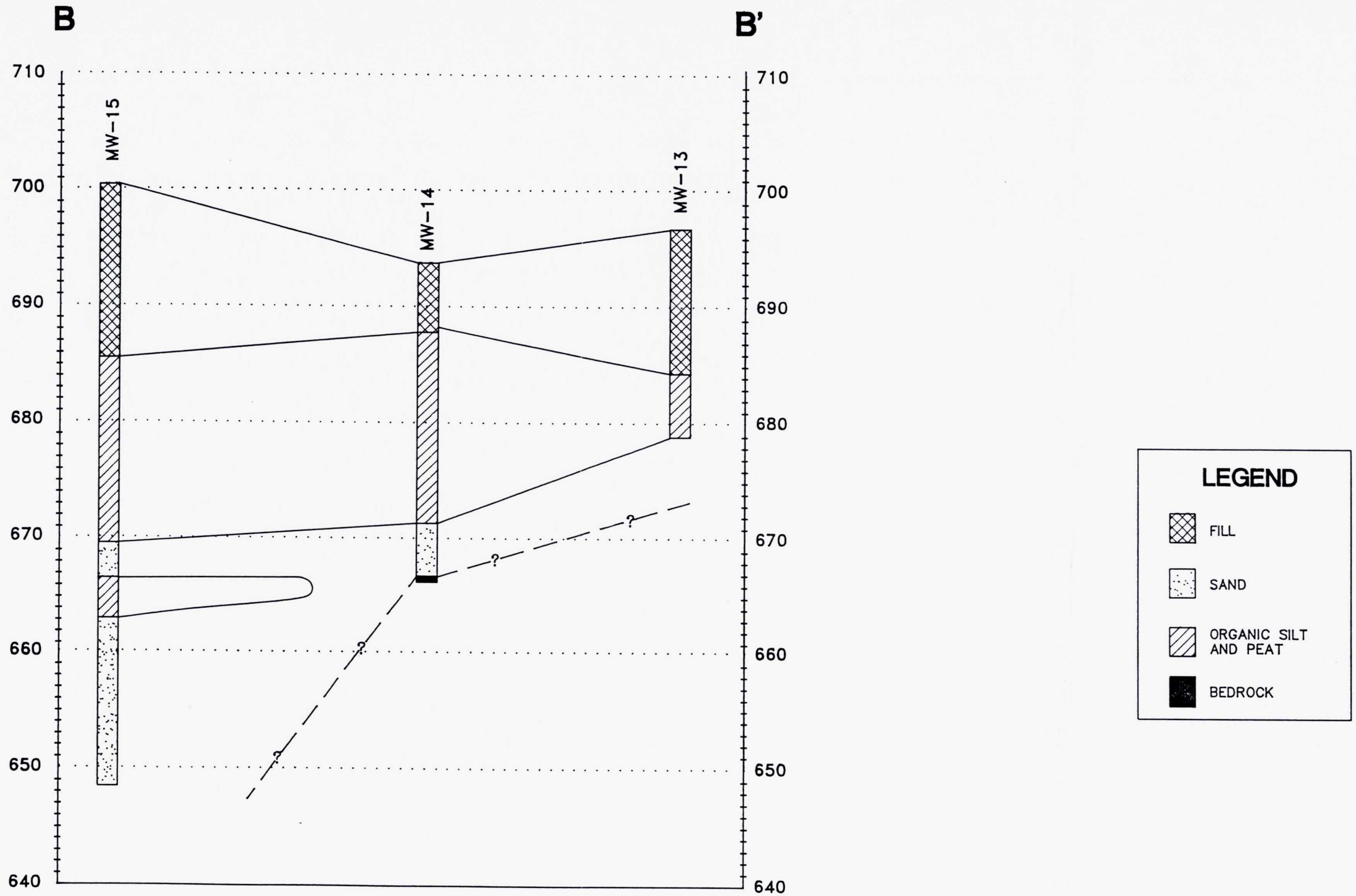


PIG'S EYE DUMP
ST. PAUL, MINNESOTA

FIGURE 4-7

CROSS SECTION A-A'

PRC ENVIRONMENTAL MANAGEMENT, INC.



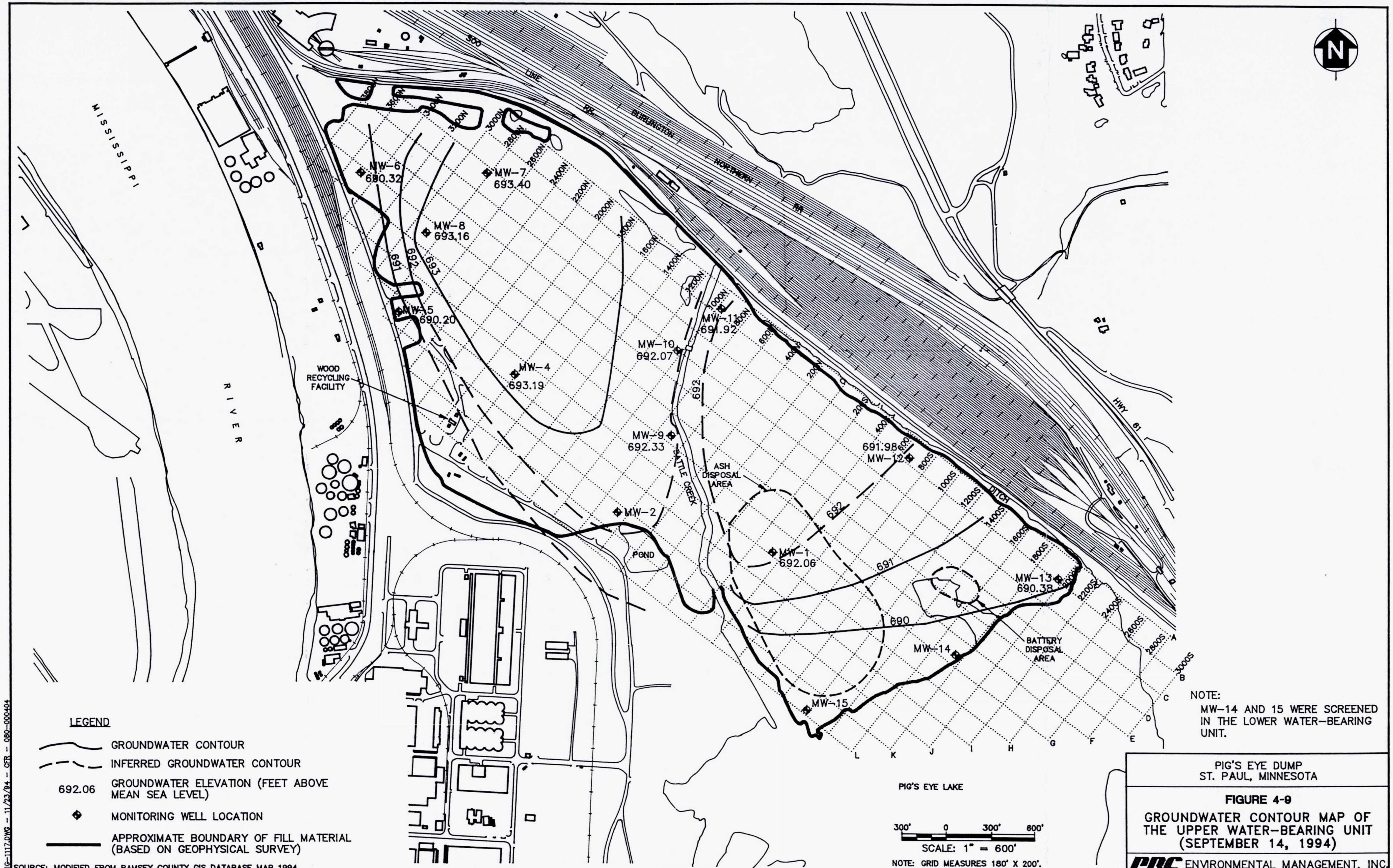
SCALES:
HORIZONTAL: 1" = 400'
VERTICAL: 1" = 10'

PIG'S EYE DUMP
ST. PAUL, MINNESOTA

FIGURE 4-8
CROSS SECTION B-B'

PRC ENVIRONMENTAL MANAGEMENT, INC.

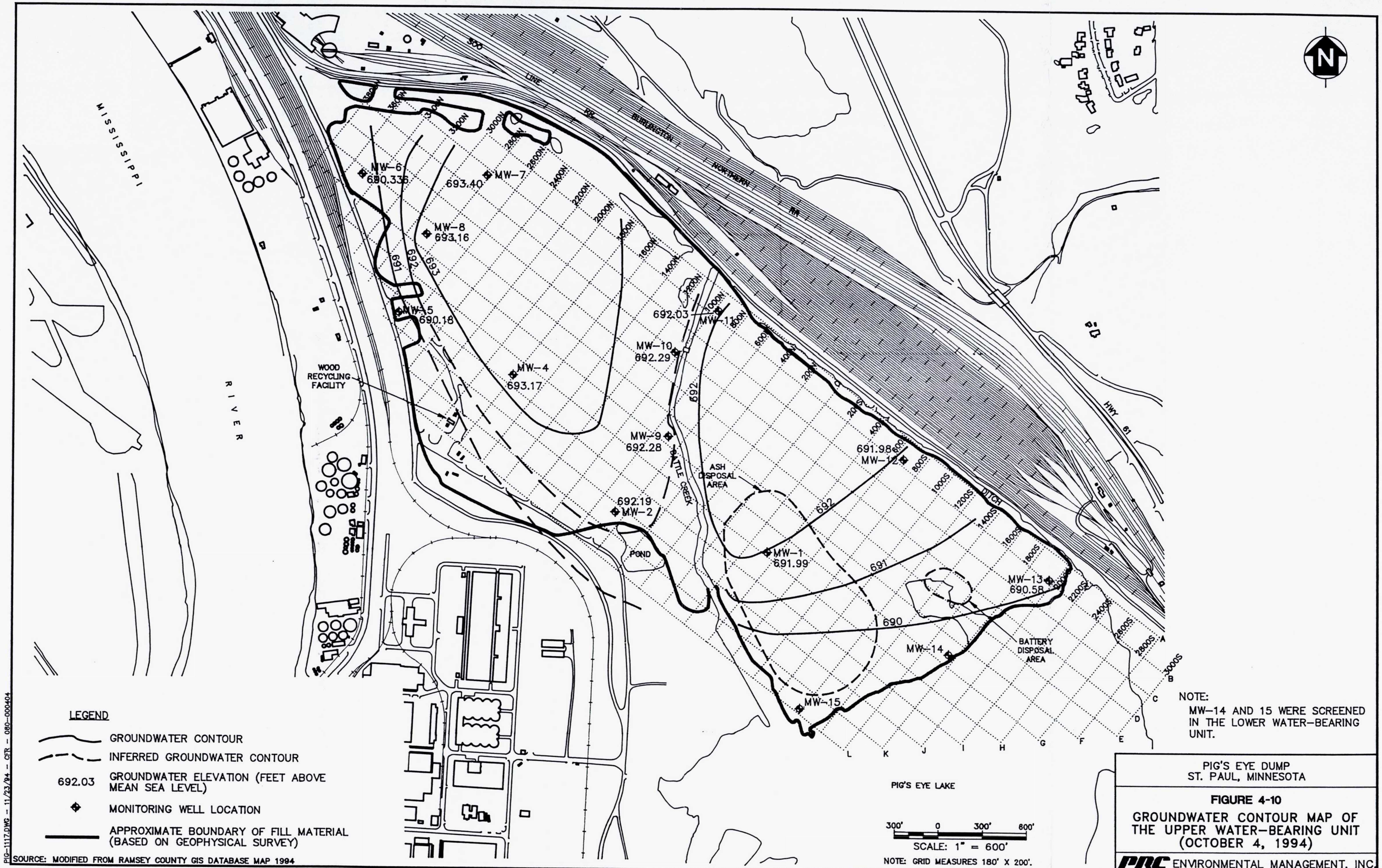
CS-BB.DWG - 11/23/94 - CFR - 080-000404



PIG'S EYE DUMP
ST. PAUL, MINNESOTA

FIGURE 4-9
GROUNDWATER CONTOUR MAP OF THE UPPER WATER-BEARING UNIT (SEPTEMBER 14, 1994)

PRC ENVIRONMENTAL MANAGEMENT, INC.



PIG'S EYE DUMP
ST. PAUL, MINNESOTA

FIGURE 4-10
GROUNDWATER CONTOUR MAP OF THE UPPER WATER-BEARING UNIT (OCTOBER 4, 1994)

PRC ENVIRONMENTAL MANAGEMENT, INC.

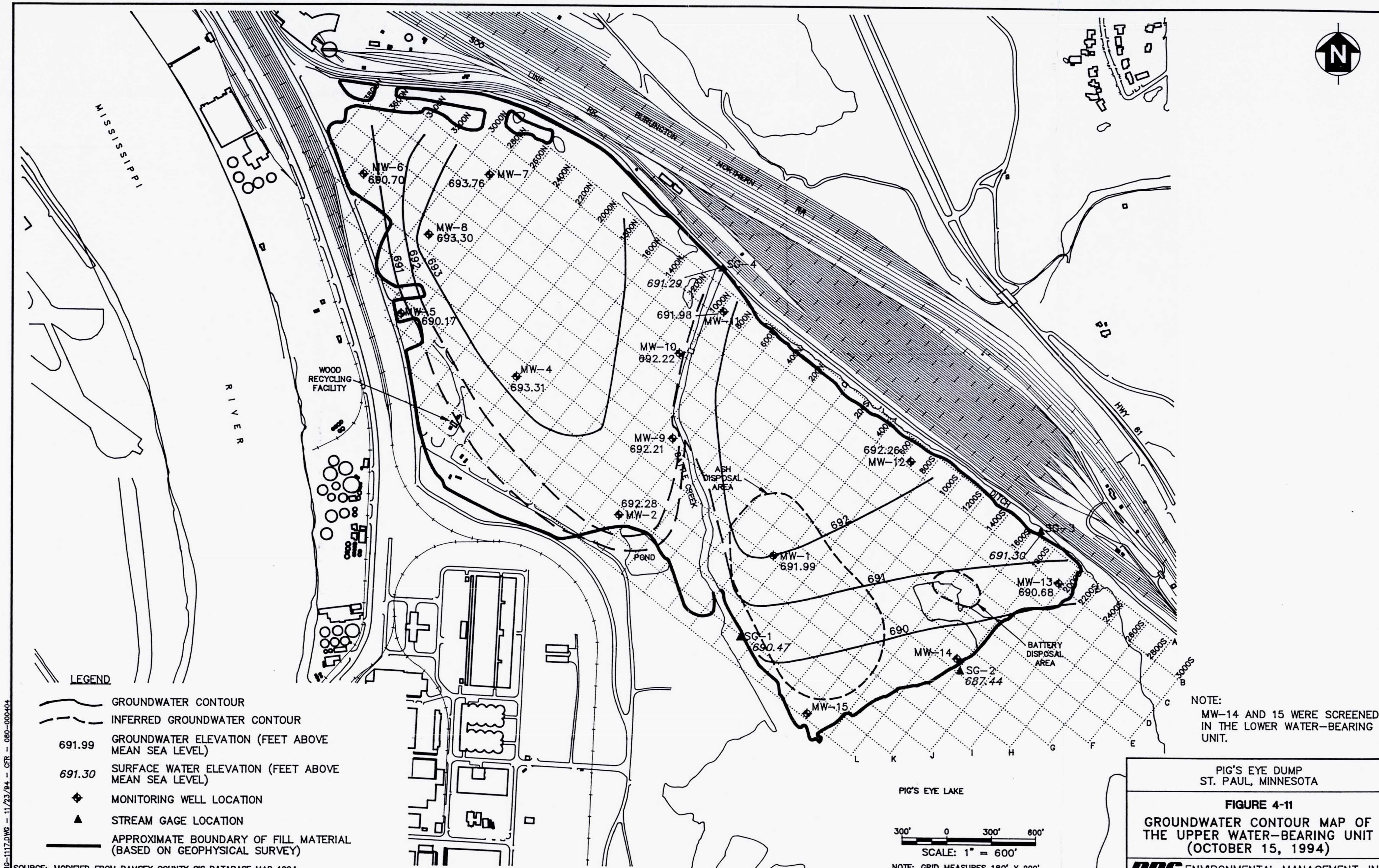

MISSISSIPPI
RIVER
BURLINGTON NORTHERN RR
SOO LINE RR
HWY 61
WOOD RECYCLING FACILITY
ASH DISPOSAL AREA
BATTERY DISPOSAL AREA
POND
BATTLE CREEK
DITCH
PIG'S EYE LAKE
MW-6 690.70
MW-7 693.76
MW-8 693.30
MW-5 690.17
MW-4 693.31
MW-11 691.98
SG-4 691.29
MW-10 692.22
MW-9 692.21
MW-12 692.26
MW-2 692.28
MW-1 691.99
SG-3 691.30
MW-13 690.68
SG-1 690.47
MW-14
SG-2 687.44
MW-15
690
691
692
693
LEGEND
GROUNDWATER CONTOUR
INFERRED GROUNDWATER CONTOUR
691.99 GROUNDWATER ELEVATION (FEET ABOVE MEAN SEA LEVEL)
691.30 SURFACE WATER ELEVATION (FEET ABOVE MEAN SEA LEVEL)
MONITORING WELL LOCATION
STREAM GAGE LOCATION
APPROXIMATE BOUNDARY OF FILL MATERIAL (BASED ON GEOPHYSICAL SURVEY)
SOURCE: MODIFIED FROM RAMSEY COUNTY GIS DATABASE MAP 1994
PIG-1117.DWG - 11/23/94 - CFR - 080-000404
SCALE: 1" = 600'
NOTE: GRID MEASURES 180' X 200'.
NOTE:
MW-14 AND 15 WERE SCREENED IN THE LOWER WATER-BEARING UNIT.
PIG'S EYE DUMP
ST. PAUL, MINNESOTA
FIGURE 4-11
GROUNDWATER CONTOUR MAP OF THE UPPER WATER-BEARING UNIT (OCTOBER 15, 1994)
PRC ENVIRONMENTAL MANAGEMENT, INC.

TABLE 4-1

GROUNDWATER ELEVATIONS ON SEPTEMBER 14, 1994[a]

Monitoring Well No.	Top of Riser Elevation[a]	Depth to Groundwater[b]	Groundwater Elevation[a]
MW-1	708.19	16.13	692.06
MW-2	703.37	Not Measured	Not Measured
MW-4	705.80	12.61	693.19
MW-5	703.82	13.62	690.20
MW-6	705.29	14.97	690.32
MW-7	706.30	12.90	693.40
MW-8	705.15	11.99	693.16
MW-9	702.54	10.21	692.33
MW-10	702.17	10.10	692.07
MW-11	704.43	12.51	691.92
MW-12	703.09	11.11	691.98
MW-13	699.25	8.87	690.38
MW-14	695.98	6.94	689.04
MW-15	702.55	14.89	687.66

Notes:

a Presented in feet above MSL

b Measured in feet bgs

TABLE 4-2

GROUNDWATER ELEVATIONS ON OCTOBER 4, 1994

Monitoring Well No.	Top of Riser Elevation[a]	Depth to Groundwater[b]	Groundwater Elevation[a]
MW-1	708.19	16.23	691.96
MW-2	703.37	11.18	692.19
MW-4	705.80	12.63	693.17
MW-5	703.82	13.64	690.18
MW-6	705.29	14.93	690.36
MW-7	706.30	12.90	693.40
MW-8	705.15	11.99	693.16
MW-9	702.54	10.26	692.28
MW-10	702.17	9.88	692.29
MW-11	704.43	12.40	692.03
MW-12	703.09	11.10	691.99
MW-13	699.25	8.67	690.58
MW-14	695.98	7.17	688.81
MW-15	702.55	15.20	687.35

Notes:

a Presented in feet above MSL

b Measured in feet bgs

TABLE 4-3

GROUNDWATER ELEVATIONS ON OCTOBER 15, 1994

Monitoring Well No.	Top of Riser Elevation[a]	Depth to Groundwater[b]	Groundwater Elevation[a]
MW-1	708.19	16.20	691.99
MW-2	703.37	11.09	692.28
MW-4	705.80	12.49	693.31
MW-5	703.82	13.65	690.17
MW-6	705.29	14.59	690.70
MW-7	706.30	12.54	693.76
MW-8	705.15	11.85	693.30
MW-9	702.54	10.33	692.21
MW-10	702.17	9.95	692.22
MW-11	704.43	12.45	691.98
MW-12	703.09	10.83	692.26
MW-13	699.25	8.57	690.68
MW-14	695.98	7.15	688.83
MW-15	702.55	14.66	687.89

Notes:

a Presented in feet above MSL

b Measured in feet bgs

TABLE 4-4

SURFACE WATER ELEVATIONS ON OCTOBER 15, 1994

Stream Gage	Reference Elevation[b]	Depth of Surface Water[c]	Surface Water Elevation[a]
SG-1	692.56	0.91	690.47
SG-2	687.22	3.22	687.44
SG-3	692.39	1.91	691.30
SG-4	692.75	1.54	691.29

Notes:

[a] Presented in feet above MSL

[b] Measured at 3.0 foot mark on gage

[c] Measured in feet

5.0 NATURE AND EXTENT OF CONTAMINATION

This section discusses the nature and extent of contamination in the soil gas, groundwater, surface water, and sediment at the Pig's Eye site based on the analysis of samples collected during the LRI activities.

The results of the soil gas survey, groundwater analysis, surface water analysis, and sediment analysis are discussed below. The analytical data presented in this section are from analyses performed by the CLP laboratory unless otherwise indicated. The data reported by the CLP laboratory performing the analyses were validated by PRC. Analytes detected above laboratory method detection limits are summarized in tables in this section. Complete CLP analytical results and a data summary are included in Appendix F.

5.1 SOIL GAS SURVEY RESULTS

The purpose of the soil gas survey was to determine if VOCs are present in the fill material soil gas and to provide data to plan additional field activities such as Geoprobe™ groundwater sampling, monitoring well installation, and trenching. Soil gas samples were collected from 105 locations at the Pig's Eye site during the weeks of April 18 and April 25, 1994. The sampling locations are shown in Figure 3-1. The depths at which the soil gas samples were collected is presented in Table 3-1. The samples were analyzed by PRC's CSL for chlorinated VOCs and for aromatic and other VOCs. These compounds and their method detection limits are presented in Appendix G. The QA/QC procedures for PRC's CSL data are also discussed in the data summary of Appendix G.

Trichlorofluoromethane; 1,1-dichloroethene (DCE); methylene chloride; trans-1,2-DCE; 1,1-dichloroethane (DCA); cis-1,2-DCE; chloroform; 1,1,1-trichloroethane (TCA); carbon tetrachloride; trichloroethene (TCE); perchloroethene (PCE); and 1,1,1,2-perchloroethane (PCA) were detected above laboratory method detection limits. Tables 5-1 and 5-2 summarize the analytical results for the chlorinated VOCs and the aromatic and other VOCs, respectively. The concentrations are presented in parts per billion (ppb). Figures 5-1A and 5-1B of the Attachment show the concentrations of each chlorinated VOC at each sampling location at which they were detected. Figure 5-2 of the Attachment shows the concentrations of each aromatic or other VOC at each sampling location at which they were detected.

TCE and PCE were the two most commonly detected chlorinated VOCs in the soil gas. Methyl tert-butyl ether, benzene, methyl isobutyl ketone (MIBK), ethylbenzene, and total xylenes are the most commonly detected aromatic or other VOCs. In general, the detection of these compounds was widely dispersed throughout the sampling area.

5.2 GEOPROBE™ GROUNDWATER SAMPLING RESULTS

Groundwater samples were collected using PRC's Geoprobe™ at 40 locations during the weeks of April 25 and May 2, 1994. The locations of the samples are shown in Figure 3-2. The depths at which these samples were collected are shown in Table 3-2. Forty-four samples, including four duplicate samples, were analyzed by the CLP laboratory for VOCs. Fourty-three samples, including four duplicate samples were analyzed by the CLP laboratory for SVOCs, metals (including cyanide), pesticides, and PCBs. The analytical results for each analyte group are discussed below. The CLP analytical results were compared to the Minnesota Department of Health's (MDH) Recommended Allowable Limits for Drinking Water Contaminants (RAL) (MDH 1992). All but one of the samples (J2400N) were also analyzed by PRC's CSL for VOCs. PRC's CSL analyzed the samples to get real-time data to help guide future field activities. The DCBs were analyzed as a SVOC by the CLP laboratory and as a VOC by PRC's CSL.

5.2.1 VOC Analytical Results

Seventeen VOCs were detected above laboratory method detection limits in samples analyzed by the CLP laboratory. The analytical results for VOCs detected in groundwater are presented in Table 5-3. Table 5-3 also includes total VOC concentrations, VOC tentatively identified compounds (TIC) grouped by chemical class, and total VOC TIC concentrations.

The VOC concentrations detected were compared to the RALs (MDH 1992). Of VOCs having an RAL assigned, benzene and 1,1-DCE are the only compounds detected at concentrations exceeding their respective RALs at a minimum of one sampling location. Benzene was detected above its RAL of 10 ppb in 16 samples and 1,1-DCE was detected above its RAL of 6 ppb in one sample. Several

VOC TICs were detected above laboratory method detection limits in the groundwater samples collected. In general, most of the TICs detected appear to be hydrocarbon related. Figure 5-3 of the Attachment shows the concentrations of benzene; 1,1-DCE; total VOCs; and total VOC TICs at each sampling location at which they were detected.

Thirteen VOCs were detected above laboratory method detection limits by PRC's CSL. PRC's CSL analytical results are presented in Table 5-4. The laboratory method detection limits for these analytes are included in Appendix G. Of VOCs having an RAL, benzene and 1,4-DCB are the only compounds detected at concentrations exceeding their respective RALs at a minimum of one sampling location. Benzene was detected above its RAL in 10 samples. Benzene was also detected above its RAL by the CLP laboratory. The 1,4-DCB was detected above its RAL of 10 ppb in seven samples. Figure 5-4 of the Attachment shows the concentrations of benzene and 1,4-DCB at each sampling location at which they were detected.

5.2.2 SVOC Analytical Results

Thirty-six SVOCs were detected above laboratory method detection limits in the Geoprobe™ groundwater samples analyzed by the CLP laboratory. The analytical results are summarized in Table 5-5. Also included in Table 5-5 are the results for total SVOC concentrations, SVOC TICs grouped by chemical class, and total SVOC TIC concentrations.

Of SVOCs having a RAL, bis (2-chloroethyl) ether; 1,4-DCB; nitrobenzene; and naphthalene were detected at concentrations exceeding their respective RALs at a minimum of one sampling location. Bis (2-chloroethyl) ether was detected above its RAL of 0.3 ppb in one sample. The 1,4-DCB was detected above its RAL of 10 ppb in one sample. Nitrobenzene was detected above its RAL of 3 ppb in eight samples. Naphthalene was detected above its RAL of 30 ppb in seven samples. Several SVOC TICs were detected in the groundwater samples collected. In general, most of the TICs detected appear to be hydrocarbon related. Figure 5-5 of the Attachment shows the locations at which these compounds were detected above laboratory method detection limits, along with the total SVOC and total SVOC TIC concentrations.

5.2.3 Metal Analytical Results

Eighteen metals were detected above laboratory detection limits in the Geoprobe™ groundwater samples analyzed by the CLP laboratory. The analytical results are presented in Table 5-6.

Of analytes having an RAL, seven of the analytes detected above laboratory method detection limits were detected at concentrations exceeding their respective RALs at a minimum of one sampling location. They include antimony, arsenic, cobalt, manganese, mercury, nickel, and thallium. Arsenic and manganese were the most frequently detected metals exceeding their RALs. Arsenic exceeded its RAL of 1.0 ppb in 23 samples, and manganese exceeded its RAL of 300 ppb in 20 samples. Antimony exceeded its RAL of 1.0 ppb in four samples. Cobalt exceeded its RAL of 1.0 ppb in eight samples. Mercury, nickel, and thallium exceeded their respective RALs of 1.0, 70, and 0.3 ppb in one sample each. The concentrations of the seven metals exceeding RALs at each sampling location are shown in Figure 5-6 of the Attachment.

5.2.4 Pesticide Analytical Results

Five pesticides were detected above laboratory method detection limits in the Geoprobe™ groundwater samples collected from the Pig's Eye site. They include delta-BHC; alpha chlordane; gamma chlordane; 4,4-DDT; and 4,4-DDD. Delta-BHC and alpha chlordane were each detected at one sampling location only. Gamma chlordane and 4,4-DDT were detected at two sampling locations. At three sampling locations, 4,4-DDD was detected. Table 5-7 presents a summary of the analytical results. Figure 5-7 of the Attachment shows the concentrations of the five pesticides detected above laboratory method detection limits at each of the sampling locations at which they were detected.

5.2.5 PCB Analytical Results

The PCBs detected above laboratory method detection limits in Geoprobe™ groundwater samples included Aroclor 1221, Aroclor 1242, Aroclor 1254, and Aroclor 1260. Aroclor 1242 was the most commonly detected PCB (detected in eight samples). Aroclor 1221 and Aroclor 1260 were each detected in two samples. Aroclor 1254 was detected in one sample. Table 5-8 presents a summary of PCB analytical results. The concentrations of each Aroclor species are shown by sampling location in Figure 5-8 of the Attachment.

5.3 MONITORING WELL GROUNDWATER SAMPLING RESULTS

Seventeen groundwater samples, including two duplicate samples, were collected from the 15 on-site groundwater monitoring wells during the week of August 29, 1994. The samples were analyzed by the CLP laboratory for VOCs, SVOCs, metals (including cyanide), pesticides, and PCBs. Because the pesticide/PCB sample from monitoring well MW-8 was lost during extraction, monitoring well MW-8 was sampled again on September 14, 1994, and the sample was submitted to the CLP laboratory and analyzed for pesticides and PCBs. The analytical results for each analyte group are discussed below.

5.3.1 VOC Analytical Results

Twelve VOCs were detected above laboratory method detection limits in the groundwater samples collected from the Pig's Eye site. Analytical results are presented in Table 5-9. Table 5-9 also presents total VOC concentrations, VOC TICs grouped by chemical class, and total VOC TIC concentrations.

VOC concentrations were compared to MDH RALs (MDH 1992). Of those VOCs having a RAL, benzene was the only compound detected at concentrations exceeding its RAL at a minimum of one sampling location. Benzene was detected above its RAL of 10 ppb in six monitoring wells (MW-1, MW-4, MW-6, MW-8, MW-9, and MW-13). Several VOC TICs were detected in the groundwater samples collected. Most of the TICs detected appear to be hydrocarbon related. Figure 5-9 of the Attachment shows the concentrations of benzene, total VOCs, and total VOC TICs at each sampling location at which they were detected.

5.3.2 SVOC Analytical Results

Fifteen SVOCs were detected above laboratory method detection limits in the groundwater samples collected at the Pig's Eye site. The analytical results are presented in Table 5-10. Table 5-10 also presents total SVOC concentrations, SVOC TICs grouped by chemical class, and total SVOC TIC concentrations.

Analytical results were compared to MDH RALs (MDH 1992). None of the compounds detected above laboratory method detection limits that also have an RAL were detected at concentrations exceeding their RALs. Several SVOC TICs were detected in the groundwater samples collected. Most of the TICs detected appear to be hydrocarbon related. Figure 5-10 of the Attachment shows total SVOC and total SVOC TIC concentrations at each sampling location at which SVOCs were detected.

5.3.3 Metal Analytical Results

Twenty-one metals were detected above laboratory method detection limits in the groundwater samples collected from the Pig's Eye site. The analytical results are presented in Table 5-11. Seven metals, including antimony, cobalt, manganese, nickel, selenium, thallium, and zinc, were detected at concentrations exceeding the RALs. Antimony exceeded its RAL of 1.0 ppb in three samples. Cobalt exceeded its RAL of 1.0 ppb in 10 samples. Manganese exceeded its RAL of 300 ppb in 12 samples. Nickel exceeded its RAL of 70 ppb in one sample. Selenium exceeded its RAL of 10 ppb in seven samples. Thallium exceed its RAL of 0.3 ppb in one sample. Zinc exceeded its RAL of 700 ppb in one sample. Figure 5-11 of the Attachment shows the total concentrations of metals that exceed their respective RALs at a minimum of one sampling location.

5.3.4 Pesticide Analytical Results

Aldrin was the only pesticide detected above laboratory method detection limits in the groundwater samples collected from the on-site groundwater monitoring wells. Aldrin was detected in monitoring well MW-7 at a concentration of 0.069 ppb. This concentration exceeds aldrin's RAL of 0.02 ppb.

5.3.5 PCB Analytical Results

Aroclor 1242 was the only PCB detected above laboratory method detection limits in the groundwater samples collected. Aroclor 1242 was detected in monitoring well MW-8 at a concentration of 3.9 ppb.

5.4 SURFACE WATER SAMPLING RESULTS

Six surface water samples, including one duplicate sample, were collected from five locations at the Pig's Eye site during the week of June 6, 1994. The samples were analyzed by the CLP laboratory for VOCs, SVOCs, metals (including cyanide), pesticides, and PCBs. The analytical results were compared to Ambient Water Quality Criteria (AWQC) (EPA 1992). The analytical results for each analyte group are discussed below.

5.4.1 VOC Analytical Results

Nine VOCs were detected above laboratory method detection limits in any of the six samples analyzed. Analytical results are presented in Table 5-12. Table 5-12 presents total VOC concentrations, VOC TICs by chemical class, and total VOC TIC concentrations. None of the compounds detected have been assigned an AWQC value. Total VOC and VOC TIC concentrations at each sampling location are presented in Figure 5-12 of the Attachment.

5.4.2 SVOC Analytical Results

Twelve SVOCs were detected above laboratory method detection limits in the six samples analyzed. Analytical results are presented in Table 5-13. Table 5-13 presents total SVOC concentrations, SVOC TICs by chemical class, and total SVOC TIC concentrations. None of the compounds detected have been assigned an AWQC value. Total SVOC and total SVOC TIC concentrations detected at each sampling location are presented in Figure 5-12 of the Attachment.

5.4.3 Metal Analytical Results

Twenty-one metals were detected above laboratory method detection limits in the six surface water samples. Analytical results are presented in Table 5-14. All but two of the metals were detected above laboratory method detection limits in sample E1600S. Surface water sample E1600S was collected near the battery disposal area. Of analytes having an AWQC value, cadmium, copper, iron, lead, mercury, nickel, zinc, and cyanide were detected at concentrations exceeding their AWQCs at a minimum of one sampling location.

Cadmium was detected at a concentration exceeding its AWQC of 1.1 ppb in one sample. Copper was detected at a concentration greater than its AWQC of 12 ppb in one sample. Iron was detected at a concentration exceeding its AWQC of 1,000 ppb in all six samples. Lead was detected at a concentration exceeding its AWQC of 3.2 ppb in three samples. Mercury, nickel, and zinc each exceeded their AWQCs of 0.012, 160, and 110 ppb, respectively in one sample. Cyanide was detected at a concentration exceeding its AWQC of 5.2 ppb in three samples. The concentrations of these eight metals at each sampling location are presented in Figure 5-13 of the Attachment.

5.4.4 Pesticide Analytical Results

One pesticide was detected above its laboratory method detection limit by the CLP laboratory in the surface water samples collected from the Pig's Eye site. Beta BHC was detected at a concentration of 0.026 ppb at sampling location H1800S.

5.4.5 PCB Analytical Results

PCBs were not detected above laboratory method detection limits in the six samples analyzed.

5.5 SEDIMENT SAMPLING RESULTS

Six sediment samples, including one duplicate sample, were collected from five locations at the Pig's Eye site on May 5, 1994. In addition, two sediment samples were collected on September 14, 1994 from the pond located along the southwest edge of the dump site. The samples were analyzed by the CLP laboratory for VOCs, SVOCs, total metals (including cyanide), pesticides, and PCBs. Analytical results for sediment samples were compared to the toxicity characteristic leaching procedure (TCLP) standard multiplied by a factor of 20. The TCLP standard times 20 represents a minimum concentration at which leachate from the sediment sample has the potential to exceed the TCLP standard. The analytical results for each analyte group are discussed below.

5.5.1 VOC Analytical Results

Seven VOCs were detected above laboratory method detection limits in the six samples collected on May 5, 1994. Four VOCs were detected above laboratory method detection limits in the two samples collected on September 14, 1994. Analytical results for the May 5, 1994 and September 14, 1994 sampling events are presented in Table 5-15 and Table 5-16, respectively. Table 5-15 and 5-16 also presents total VOC concentrations detected in each sample. Of analytes having a TCLP standard, none were detected at concentrations exceeding the TCLP standard times 20. Total VOC and total VOC TIC concentrations for each sampling event at each sampling location are presented in Figure 5-14 of the Attachment.

5.5.2 SVOC Analytical Results

Nineteen SVOCs were detected above laboratory method detection limits in the six samples collected on May 5, 1994. Bis(2-ethylhexyl)phthalate was the only SVOC detected above laboratory method detection limits in the samples collected on September 14, 1994; specifically in sample S-2 only. The analytical results for the May 5, 1994 and the September 14, 1994 sampling events are presented in Table 5-17 and 5-18, respectively. Both tables also present the concentrations of total SVOCs, SVOC TICs by chemical class, and total SVOC TICs. Only two of the SVOCs detected in the May 5 samples have been assigned a TCLP standard (1,4-DCB and naphthalene); however, these analytes were not detected at concentrations exceeding the TCLP standard times 20. A TCLP limit has not been assigned to bis(2-ethylhexyl)phthalate. The SVOC TICs appear to be hydrocarbon related. Figure 5-14 of the Attachment shows the concentrations of total SVOCs and total SVOC TICs detected at each sampling location for each sampling event.

5.5.3 Metal Analytical Results

Twenty-one metals were detected above laboratory method detection limits in the samples collected on May 5, 1994. Twenty-three metals, including cyanide, were detected above laboratory method detection limits in the samples collected on September 14, 1994. Analytical results for the May 5, 1994 and the September 14, 1194 sampling events are presented in Table 5-19 and Table 20, respectivley . Of metals having a TCLP standard, only chromium and lead were detected at concentrations exceeding their TCLP standard times 20 in the samples collected May 5, 1994; chromium at one sampling location, and lead at three. Cadmium, chromium, and lead were detected above the TCLP limit times 20 in the samples collected September 14, 1994. The concentrations of cadmium, chromium, and lead detected at each sampling location for each sampling event are shown in Figure 5-15 of the Attachment.

5.5.4 Pesticide Analytical Results

Five pesticides were detected above laboratory method detection limits in the six samples collected on May 5, 1994. They include 4,4-DDE; 4,4-DDT; 4,4-DDD; aldrin; and gamma chlordane. Analytical results are presented in Table 5-21. Pesticides, however, were not detected above laboratory method detection limits in the samples collected on September 14, 1994. None of the analytes detected in the May 5, 1994 samples have been assigned a TCLP standard. The concentrations of the pesticides detected above laboratory method detection limits in the May 5, 1994 samples are shown by sampling location in Figure 5-16 of the Attachment.

5.5.5 PCB Analytical Results

PCBs were not detected above laboratory method detection limits in any of the six samples collected on May 5, 1994. However, Aroclor 1248 and 1254 were detected above laboratory method detection limits in sample SED-1 collected on September 14, 1994. The analytical results are presented in Table 5-22.

5.6 TRENCH SOIL SAMPLING RESULTS

Soil samples, T2-1 and T3-1, were collected from trenches T-2 and T-3, respectively. The samples were collected from fill material stockpiled next to the trenches and represented soil at a depth of approximately 10 to 12 feet below ground surface. The samples were analyzed by the CLP laboratory for VOCs, SVOCs, total metals (including cyanide), pesticides, and PCBs. Analytical results for sediment samples were compared to the toxicity characteristic leaching procedure (TCLP) standard multiplied by a factor of 20. The TCLP standard times 20 represents a minimum concentration at which leachate from the sediment sample has the potential to exceed the TCLP standard. The analytical results for each analyte group are discussed below.

5.6.1 VOC Analytical Results

Six VOCs were detected above laboratory method detection limits in the samples collected. The analytical results are presented in Table 5-23. Where only acetone was detected in sample T3-1, all six VOCs were detected in sample T2-1 or its duplicate. Of the VOCs detected, only chlorobenzene has been assigned a TCLP limit. However, chlorobenzene, detected in T2-1 and its duplicate sample, were not detected at concentrations greater than the TCLP limit times 20. Total VOC, VOC TICs by classification, and total VOC TIC concentrations are also presented in Table 5-23. The TICs identified in the samples appear to be hydrocarbon related.

5.6.2 SVOC Analytical Results

Eighteen SVOCs were detected above laboratory method detection limits in the samples collected. The analytical results are presented in Table 5-24. Of the SVOCs detected, only 1,4-DCB has been assigned a TCLP limit. The concentrations of 1,4-DCB detected in sample T2-1 and its duplicate sample were detected at concentrations greater than its TCLP limit times 20 (150 ppb). 1,4-DCB was not detected above laboratory method detection limits in sample T3-1. Total VOC, VOC TICs by classification, and total VOC TIC concentrations are also presented in Table 5-23. The TICs identified in the samples appear to be hydrocarbon related.

5.6.3 Metal Analytical Results

Twenty-three metals were detected above laboratory method detection limits in the samples collected. The analytical results are presented in Table 5-25. Of the metals assigned a TCLP standard, three metals, including cadmium, chromium, and lead, were detected at concentrations exceeding their TCLP limit times 20. All three of the metals detected at concentrations exceeding their TCLP limit times 20 were detected in sample T3-1.

5.6.4 Pesticide Analytical Results

Pesticides were not detected above laboratory method detection limits in the trench soil samples collected.

5.6.5 PCB Analytical Results

Three PCBs were detected above laboratory method detection limits in the samples collected. The analytical results are presented in Table 5-26. Aroclor 1016, 1254, and 1260 were detected above laboratory method detection limits in sample T3-1. Only Aroclor 1254 was detected above laboratory method detection limits in sample T2-1.

5.7 TRENCHING OBSERVATIONS

Four trenches, T-1 through T-4, were dug at locations as depicted in Figure 3-6. Each trench was approximately 3 feet x 30 feet x 12 feet deep. All four trenches were backfilled upon completion. Below is a discussion of our observations during trenching operations.

5.7.1 Trench T-1

Trench T-1 was dug near grid location F3000N. Groundwater began entering the trench when the depth of the trench reached approximately 10 feet bgs. The trench was dug to a depth at which the fill material ended (approximately 12 feet). The fill observed was comprised predominantly of household waste. A newspaper dated 1967 was identified in the refuse. Some of the items observed included, but were not limited to, a few tires, spray paint cans, a few battery casings, paint cans, and a crushed five-gallon pail containing a solidified black tar-like substance.

5.7.2 Trench T-2

Trench T-2 was dug near grid location E200N. The fill observed was comprised predominantly of household and industrial waste to a depth of approximately 12 feet bgs. A newspaper dated March 12, 1972 was found within the top five feet of the fill. Some of the items observed included, but were not limited to, a tires, tree stumps and logs, plastic ribbon which appeared to be for commercial or industrial purposes, medical waste including a plastic bag containing an unknown liquid and used syringes, paint cans, a few battery casings, a spray can with the ingredient "methylene chloride" written on it, and several circuit boards.

5.7.3 Trench T-3

Trench T-3 was dug near grid location H400S. The fill observed was comprised predominantly of industrial and household waste to a depth of approximately 12 feet bgs. A newspaper dated December 31, 1971 and was identified in the refuse. Some of the items observed included, but were not limited to, battery casings, a large roll of paper approximately three feet in diameter, a vial of clinical strips for glucose testing, a document with "St. Paul Insurance Co." on it, a document with "Western Insurance Co." on it, and a cardboard box with an address label reading "3M" on it.

5.7.4 Trench T-4

Trench T-4 was dug near grid location C400S. The fill observed was comprised predominantly of building debris and some household waste. A newspaper dated June 13, 1971 was identified in the refuse. Some of the items observed included, but were not limited to, lumber, paint cans, an empty can of radiator antifreeze and waterpump lubricant, and two crushed drums with no identifiable labels, writing, or contents.

TABLE 5-1

CHLORINATED VOC CONCENTRATIONS IN SOIL GAS
(Results in ppb)

Sample Number	Vinyl Chloride	Trichloro-fluoro-methane	1,1-DCE	Methylene Chloride	trans-1,2-DCE	1,1-DCA	cis-1,2-DCE	Chloroform	1,1,1-TCA	Carbon Tetrachloride	1,2-DCA	TCE	1,1,2-TCA	PCE	1,1,1,2-PCA	1,1,2,2-PCA
B-1000N	BDL[a]	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	19.8	BDL	5.11	BDL	BDL
B-800N	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	9.00	BDL	16.4	BDL	BDL
B-600N	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	6.62	BDL	BDL
B-400N	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
B-200N	BDL	BDL	BDL	BDL	BDL	BDL	BDL	19.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
B-00	BDL	154	BDL	BDL	BDL	BDL	BDL	21.8	BDL	BDL	BDL	13.2	BDL	17.1	BDL	BDL
B-600S	BDL	10.3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	10.9	BDL	12.2	BDL	BDL
B-800S	BDL	3.07	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	30.8	BDL	BDL
C-400N	BDL	198	415	7,180	BDL	2,550	6,600	35.3	1,630	BDL	BDL	2,680	BDL	303	BDL	BDL
C-200N	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	12.3	BDL	BDL
C-00	BDL	BDL	BDL	BDL	BDL	BDL	BDL	44.6	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
C-400S	BDL	1.91	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	35.6	BDL	27.2	BDL	BDL
C-600S	BDL	43.8	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	87.3	BDL	32.3	BDL	BDL
D-3600N	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	2.30	BDL	BDL
D-3400N	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	4.28	BDL	BDL
D-3200N	BDL	BDL	BDL	BDL	BDL	BDL	BDL	3.74	BDL	BDL	BDL	3.60	BDL	2.16	BDL	BDL
D-3000N	BDL	206	BDL	BDL	BDL	BDL	BDL	8.56	BDL	3.38	BDL	38.0	BDL	12.6	BDL	BDL
D-200N	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
D-00	BDL	38.3	BDL	BDL	BDL	BDL	BDL	20.8	BDL	BDL	BDL	13.3	BDL	12.1	BDL	BDL
D-200S	BDL	1,060	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	37.2	BDL	24.3	BDL	BDL
D-400S	BDL	202	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	16.6	BDL	34.1	BDL	BDL
D-600S	BDL	10.1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	12.8	BDL	32.6	BDL	BDL
D-800S	BDL	21.8	BDL	BDL	BDL	BDL	BDL	186	BDL	BDL	BDL	166	BDL	8.56	BDL	BDL
D-1000S	BDL	2,250	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	11.8	BDL	4.63	BDL	BDL
D-1200S	BDL	185	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
D-1400S	BDL	6.34	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	33.9	BDL	10.9	BDL	BDL
E-3800N	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	12.5	BDL	3.47	BDL	BDL
E-3000N	BDL	5.20	BDL	BDL	BDL	BDL	BDL	39.5	BDL	BDL	BDL	96.3	BDL	31.5	BDL	BDL
E-2600N	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	18.1	BDL	BDL	BDL	BDL

TABLE 5-1 (Continued)

CHLORINATED VOC CONCENTRATIONS IN SOIL GAS
(Results in ppb)

Sample Number	Vinyl Chloride	Trichloro-fluoro-methane	1,1-DCE	Methylene Chloride	trans-1,2-DCE	1,1-DCA	cis-1,2-DCE	Chloroform	1,1,1-TCA	Carbon Tetrachloride	1,2-DCA	TCE	1,1,2-TCA	PCE	1,1,1,2-PCA	1,1,2,2-PCA
E-200N	BDL	10,010	BDL	BDL	BDL	BDL	BDL	24.4	BDL	BDL	BDL	130	BDL	317	BDL	BDL
E-00	BDL	BDL	BDL	BDL	BDL	BDL	BDL	10.2	BDL	BDL	BDL	59.0	BDL	19.9	BDL	BDL
E-200S	BDL	2,880	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	19.5	BDL	105	BDL	BDL
E-400S	BDL	BDL	BDL	BDL	BDL	BDL	BDL	52.0	BDL	BDL	BDL	BDL	BDL	9.03	BDL	BDL
E-600S	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
E-1000S	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	2.89	BDL	BDL
F-3600N	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	11.2	BDL	BDL
F-3200N	BDL	690	BDL	BDL	BDL	BDL	BDL	15.4	BDL	BDL	BDL	29.8	BDL	40.5	BDL	BDL
F-3000N	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
F-400S	BDL	BDL	BDL	BDL	BDL	BDL	BDL	19.4	BDL	BDL	BDL	BDL	BDL	6.68	BDL	BDL
F-600S	BDL	BDL	BDL	BDL	BDL	BDL	BDL	12.0	BDL	BDL	BDL	BDL	BDL	7.33	BDL	BDL
F-800S	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	2.06	BDL	BDL
F-1200S	BDL	BDL	BDL	BDL	BDL	BDL	BDL	20.1	BDL	BDL	BDL	10.8	BDL	BDL	BDL	BDL
G-3400N	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	50.2	BDL	14.9	BDL	BDL
G-3200N	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	8.26	BDL	2.76	BDL	BDL
G-00	BDL	334	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	229	BDL	36.4	BDL	BDL
G-200S	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
G-400S	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
G-600S	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
G-800S	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	10.8	BDL	BDL
G-1000S	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
G-1200S	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
G-1400S	BDL	453	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	37.7	BDL	107	BDL	BDL
H-3000N	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	25.4	BDL	BDL	254	BDL	439	BDL	BDL
H-2600N	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	13.7	BDL	4.59	BDL	BDL
H-2200N	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	21.5	BDL	3.31	BDL	BDL
H-1800N	BDL	BDL	BDL	BDL	BDL	BDL	BDL	10.6	BDL	BDL	BDL	7.58	BDL	BDL	BDL	BDL
H-00	BDL	42.0	BDL	BDL	BDL	14,200	BDL	BDL	BDL	BDL	BDL	95.2	BDL	5.20	BDL	BDL

TABLE 5-1 (Continued)

CHLORINATED VOC CONCENTRATIONS IN SOIL GAS
(Results in ppb)

Sample Number	Vinyl Chloride	Trichloro-fluoro-methane	1,1-DCE	Methylene Chloride	trans-1,2-DCE	1,1-DCA	cis-1,2-DCE	Chloroform	1,1,1-TCA	Carbon Tetrachloride	1,2-DCA	TCE	1,1,2-TCA	PCE	1,1,1,2-PCA	1,1,2,2-PCA
H-200S	BDL	9.35	745	BDL	6,980	BDL	6,990	55.0	BDL	BDL	BDL	32.2	BDL	10.0	BDL	BDL
H-400S	BDL	103	12,600	BDL	BDL	25,320	71,220	BDL	BDL	BDL	BDL	15.1	BDL	10.9	BDL	BDL
H-600S	BDL	2.03	BDL	BDL	BDL	BDL	BDL	39.2	BDL	BDL	BDL	72.1	BDL	55.4	BDL	BDL
H-800S	BDL	BDL	BDL	BDL	BDL	BDL	BDL	28.4	BDL	BDL	BDL	21.3	BDL	4.36	BDL	BDL
H-1000S	BDL	1.24	BDL	BDL	BDL	BDL	BDL	28.0	BDL	BDL	BDL	12.9	BDL	11.8	BDL	BDL
H-1200S	BDL	19.3	BDL	BDL	BDL	BDL	BDL	12.1	BDL	BDL	BDL	16.2	BDL	18.6	BDL	BDL
H-1400S	BDL	166	BDL	BDL	BDL	BDL	BDL	BDL	5.81	BDL	BDL	50.2	BDL	15.8	BDL	BDL
I-2800N	BDL	263	BDL	BDL	BDL	BDL	BDL	BDL	21.1	BDL	BDL	65.5	BDL	24.8	BDL	BDL
I-2600N	BDL	8.86	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	15.0	BDL	12.9	BDL	BDL
I-2400N	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
I-2000N	BDL	BDL	BDL	BDL	BDL	BDL	BDL	71.6	BDL	BDL	BDL	20.9	BDL	14.6	BDL	BDL
I-1800N	BDL	BDL	BDL	BDL	BDL	BDL	BDL	58.3	BDL	BDL	BDL	20.2	BDL	2.15	BDL	BDL
I-1400N	BDL	BDL	BDL	BDL	BDL	BDL	BDL	16.9	BDL	BDL	BDL	12.4	BDL	19.9	BDL	BDL
I-1200N	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
I-1000N	BDL	BDL	BDL	BDL	BDL	BDL	BDL	117	BDL	BDL	BDL	57.6	BDL	BDL	BDL	BDL
I-00	BDL	9.03	411	BDL	BDL	3,640	9,100	21.5	BDL	BDL	BDL	35.1	BDL	13.1	BDL	BDL
I-200S	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	25.6	BDL	7.06	BDL	BDL
I-400S	BDL	7.90	BDL	BDL	BDL	BDL	BDL	22.5	BDL	BDL	BDL	30.3	BDL	38.9	BDL	BDL
I-600S	BDL	BDL	BDL	BDL	BDL	BDL	BDL	19.7	BDL	BDL	BDL	11.3	BDL	7.56	BDL	BDL
I-800S	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
I-1000S	BDL	BDL	BDL	BDL	BDL	BDL	BDL	10.2	BDL	BDL	BDL	17.3	BDL	12.4	BDL	BDL
I-1200S	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	4.91	BDL	BDL
I-1400S	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	7.04	BDL	BDL
J-2200N	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	2.22	BDL	BDL
J-2015N	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	11.8	BDL	10.6	BDL	BDL
J-1800N	BDL	BDL	BDL	BDL	BDL	BDL	BDL	125	BDL	BDL	BDL	31.1	BDL	5.91	BDL	BDL
J-1400N	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	6.56	BDL	BDL	BDL	BDL	27.9	BDL	BDL
J-1200N	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

TABLE 5-[illegible] (Continued)

CHLORINATED VOC CONCENTRATIONS IN SOIL GAS
(Results in ppb)

Sample Number	Vinyl Chloride	Trichloro-fluoro-methane	1,1-DCE	Methylene Chloride	trans-1,2-DCE	1,1-DCA	cis-1,2-DCE	Chloroform	1,1,1-TCA	Carbon Tetrachloride	1,2-DCA	TCE	1,1,2-TCA	PCE	1,1,1,2-PCA	1,1,2,2-PCA
J-1000N	BDL	BDL	198	BDL	1,680	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	7.70	BDL	BDL
J-800N	BDL	BDL	BDL	1,990	BDL	BDL	2,700	BDL	BDL	BDL	BDL	BDL	BDL	11.6	34.3	BDL
J-600S	BDL	82.9	BDL	BDL	BDL	BDL	BDL	127	BDL	BDL	BDL	27.0	BDL	22.6	BDL	BDL
J-800S	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	5.68	BDL	BDL	300	BDL	175	BDL	BDL
J-1000S	BDL	12.0	BDL	BDL	BDL	BDL	BDL	47.1	BDL	BDL	BDL	14.2	BDL	12.6	BDL	BDL
J-1200S	BDL	382	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	17.6	BDL	11.9	BDL	BDL
K-2200N	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	7.37	BDL	14.2	BDL	BDL
K-2000N	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
K-1800N	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
K-1600N	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
K-1400N	BDL	BDL	BDL	BDL	BDL	BDL	BDL	15.0	BDL	BDL	BDL	45.9	BDL	3.42	BDL	BDL
K-1200N	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	2.58	BDL	BDL
K-1000N	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	3.14	BDL	BDL
K-800N	BDL	1.94	BDL	BDL	BDL	BDL	BDL	57.9	BDL	BDL	BDL	39.3	BDL	2.21	BDL	BDL
L-2000N	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	8.80	BDL	BDL
L-1800N	BDL	1.45	BDL	BDL	BDL	BDL	BDL	32.1	BDL	BDL	BDL	BDL	BDL	17.5	BDL	BDL
L-1400N	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
L-1200N	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	12.3	BDL	6.57	BDL	BDL
L-1000N	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	4.76	BDL	BDL
L-800N	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

Note:

[a] BDL = Below laboratory method detection limits

TABLE 5-2

AROMATIC AND OTHER VOC CONCENTRATIONS IN SOIL GAS
(Results in ppb)

Sample Number	Methyl tert-Butyl Ether	Methyl Ethyl Ketone	Benzene	MIBK	Toluene	Chlorobenzene	Ethylbenzene	Total Xylenes
B-1000N	BDL[a]	BDL	BDL	BDL	BDL	BDL	BDL	8,040
B-800N	823	BDL	BDL	931	91.0	BDL	393	2,460
B-600N	737	BDL	288	6,920	347	BDL	1,240	6,120
B-400N	302	BDL	BDL	4,620	BDL	640	BDL	2,290
B-200N	336	BDL	1,240	1,610	11,400	BDL	2,280	6,950
B-00	665	BDL	774	2,000	99.5	BDL	1,100	5,060
B-600S	BDL	BDL	264	1,600	394	BDL	313	908
B-800S	547	BDL	145	382	275	BDL	117	404
C-400N	204	BDL	932	787	4,880	BDL	678	2,030
C-200N	BDL	BDL	161	1,210	116	798	214	1,330
C-00	BDL	BDL	1,080	9,190	BDL	BDL	2,400	23,390
C-400S	647	BDL	1,320	4,490	BDL	BDL	557	2,180
C-600S	BDL	BDL	BDL	542	BDL	BDL	427	162
D-3600N	BDL	BDL	BDL	260	BDL	BDL	195	530
D-3400N	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
D-3200N	180	BDL	452	2,660	222	BDL	838	3,550
D-3000N	220	BDL	1,270	7,870	1,710	BDL	2,560	7,130
D-200N	BDL	BDL	1,070	BDL	220	9,200	BDL	1,110
D-00	722	BDL	1,280	8,890	236	BDL	BDL	11,050
D-200S	287	BDL	3,100	5,870	5,600	BDL	9,070	22,160
D-400S	169	BDL	396	831	315	BDL	684	1,610
D-600S	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
D-800S	4,710	BDL	4,580	1,490	451	BDL	297	825
D-1000S	183	BDL	BDL	BDL	BDL	BDL	BDL	351

TABLE 5-[illegible] (Continued)

AROMATIC AND OTHER VOC CONCENTRATIONS IN SOIL GAS
(Results in ppb)

Sample Number	Methyl tert-Butyl Ether	Methyl Ethyl Ketone	Benzene	MIBK	Toluene	Chlorobenzene	Ethylbenzene	Total Xylenes
D-1200S	783	BDL	194	1,390	189	BDL	489	1,810
D-1400S	BDL	BDL	172	422	866	BDL	277	1,870
E-3800N	BDL	BDL	BDL	BDL	BDL	BDL	BDL	294
E-3000N	2,050	BDL	4,290	7,640	715	BDL	4,010	10,910
E-2600N	BDL	BDL	149	414	90.5	BDL	246	884
E-200N	BDL	BDL	2,670	20,870	8,400	BDL	16,670	78,500
E-00	777	385	1,320	4,960	2,450	BDL	6,180	17,500
E-200S	221	BDL	123	1,990	1,140	BDL	345	1,350
E-400S	BDL	BDL	689	7,060	BDL	BDL	355	5,640
E-600S	1,230	BDL	1,440	2,730	226	BDL	2,140	5,300
E-1000S	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
F-3600N	BDL	BDL	BDL	5,950	450	BDL	1,410	8,150
F-3200N	BDL	BDL	740	2,920	918	BDL	1,930	7,520
F-3000N	BDL	BDL	BDL	BDL	BDL	BDL	125	404
F-400S	537	BDL	441	3,200	222	362	506	1,920
F-600S	2,270	BDL	4,500	7,860	626	BDL	6,170	15,610
F-800S	BDL	BDL	107	597	BDL	BDL	273	1,070
F-1200S	377	BDL	490	2,160	199	BDL	3,100	9,390
G-3400N	222	BDL	254	1,480	807	BDL	600	2,120
G-3200N	BDL	BDL	135	885	140	BDL	188	459
G-00	810	BDL	4,790	1,550	19,650	BDL	4,960	13,350
G-200S	894	BDL	470	1,050	69.4	BDL	BDL	674

TABLE 5-[illegible] (Continued)

AROMATIC AND OTHER VOC CONCENTRATIONS IN SOIL GAS
(Results in ppb)

Sample Number	Methyl tert-Butyl Ether	Methyl Ethyl Ketone	Benzene	MIBK	Toluene	Chlorobenzene	Ethylbenzene	Total Xylenes
G-400S	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
G-600S	382	BDL	363	1,530	65.9	BDL	143	696
G-800S	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
G-1000S	BDL	BDL	840	1,280	258	BDL	156	751
G-1200S	BDL	BDL	BDL	BDL	BDL	BDL	130	395
G-1400S	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
H-3000N	235	BDL	762	1,300	1,100	BDL	906	4,220
H-2600N	535	BDL	926	BDL	4,200	BDL	1,130	10,700
H-2200N	834	BDL	2,120	4,610	1,170	BDL	2,620	15,020
H-1800N	1,280	BDL	2,190	2,770	491	BDL	BDL	1,460
H-00	869	BDL	2,510	2,300	65.0	BDL	375	1,490
H-200S	5,860	BDL	3,380	1,230	BDL	BDL	212	1,110
H-400S	1,180	BDL	3,310	4,100	956	BDL	2,350	9,100
H-600S	BDL	BDL	3,260	9,990	17,370	BDL	9,860	38,200
H-800S	431	BDL	565	2,360	158	2,770	1,620	3,240
H-1000S	BDL	BDL	2,200	3,490	9,940	BDL	3,130	8,940
H-1200S	BDL	BDL	BDL	14,010	1,260	BDL	9,340	32,480
H-1400S	BDL	BDL	BDL	BDL	BDL	BDL	279	821
I-2800N	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
I-2600N	526	BDL	261	BDL	BDL	BDL	BDL	184
I-2400N	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
I-2000N	612	BDL	396	297	76.4	BDL	106	155

TABLE 5-[illegible] (Continued)

AROMATIC AND OTHER VOC CONCENTRATIONS IN SOIL GAS
(Results in ppb)

Sample Number	Methyl tert-Butyl Ether	Methyl Ethyl Ketone	Benzene	MIBK	Toluene	Chlorobenzene	Ethylbenzene	Total Xylenes
I-1800N	1,140	BDL	2,010	1,360	138	BDL	155	408
I-1400N	1,190	BDL	BDL	3,710	BDL	BDL	1,670	3,690
I-1200N	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
I-1000N	523	BDL	2,910	1,410	100	1,290	BDL	BDL
I-00	612	BDL	1,130	1,710	BDL	BDL	2,050	4,410
I-200S	BDL	BDL	BDL	3,420	BDL	BDL	1,500	2,390
I-400S	BDL	BDL	4,490	4,570	434	BDL	6,240	4,980
I-600S	BDL	BDL	BDL	4,690	831	BDL	567	1,920
I-800S	BDL	BDL	BDL	BDL	BDL	BDL	BDL	254
I-1000S	BDL	BDL	3,750	7,360	BDL	BDL	BDL	11,800
I-1200S	BDL	BDL	1,020	4,950	1,040	BDL	24,300	113,700
I-1400S	BDL	BDL	BDL	2,060	BDL	BDL	956	2,160
J-2200N	BDL	BDL	190	BDL	BDL	BDL	108	72.8
J-2015N	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
J-1800N	1,900	BDL	2,510	1,530	134	BDL	120	205
J-1400N	1,420	BDL	BDL	4,430	BDL	BDL	739	2,170
J-1200N	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
J-1000N	1,170	BDL	BDL	454	BDL	BDL	184	413
J-800N	BDL	BDL	4,700	1,690	BDL	BDL	BDL	354
J-600S	1,320	BDL	2,540	12,490	2,520	BDL	12,100	36,050
J-800S	734	BDL	2,520	BDL	12,120	BDL	3,460	8,470
J-1000S	BDL	BDL	995	5,470	4,550	BDL	4,770	13,460

TABLE 5-[illegible] (Continued)

AROMATIC AND OTHER VOC CONCENTRATIONS IN SOIL GAS
(Results in ppb)

Sample Number	Methyl tert-Butyl Ether	Methyl Ethyl Ketone	Benzene	MIBK	Toluene	Chlorobenzene	Ethylbenzene	Total Xylenes
J-1200S	351	BDL	251	2,740	1,980	BDL	1,130	4,110
K-2200N	BDL	BDL	339	1,550	108	BDL	658	5,480
K-2000N	438	BDL	BDL	1,330	453	BDL	220	838
K-1800N	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
K-1600N	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
K-1400N	2,020	BDL	3,340	5,240	725	1,340	BDL	1,170
K-1200N	BDL	BDL	1,510	5,110	362	1,720	BDL	1,730
K-1000N	BDL	BDL	385	1,060	BDL	304	BDL	1,150
K-800N	414	BDL	2,720	805	BDL	BDL	BDL	111
L-2000N	BDL	BDL	BDL	2,340	429	BDL	282	1,770
L-1800N	382	BDL	79.0	691	56.2	BDL	BDL	165
L-1400N	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
L-1200N	BDL	BDL	1,270	7,910	6,900	BDL	7,440	35,600
L-1000N	3,190	BDL	455	3,160	BDL	BDL	1,060	10,400
L-800N	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

Note:

[a] BDL = Below laboratory method detection limits

TABLE 5-3

VOC CONCENTRATIONS IN GEOPROBE™ GROUNDWATER SAMPLES - CLP DATA
(Results in ppb)

VOC	A800N	A400N	B2600N	B1800N	B1800ND	B1400N	B00	B00D	B400S	B800S	B1200S	B1600S	B2000S	RAL
Chloroethane	BDL[a]	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	20	BDL	BDL	BDL	--[b]
Methylene chloride	BDL	BDL	10 UJ[c]	BDL	10 UJ	BDL	10 UJ	10 UJ	10 UJ	10 UJ	10 UJ	10 UJ	BDL	50
Acetone	10 UJ	75 UJ	BDL	27 UJ	BDL	20 UJ	15 UJ	BDL	16 UJ	17 UJ	12 UJ	14 UJ	15 UJ	700
Carbon disulfide	BDL	BDL	BDL	BDL	BDL	1 J[d]	2 J	2 J	BDL	BDL	BDL	BDL	BDL	700
1,1-DCE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	9 J[e]	6
1,1-DCA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	70
1,2-DCE(total)	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	--
2-Butanone	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	300
1,1,1-TCA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	600
TCE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	30
Benzene	BDL	BDL	10 UJ	BDL	BDL	BDL	10	11	18	38	23	27	BDL	10
4-Methyl-2-pentanone	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	300
2-Hexanone	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	--
Toluene	10 UJ	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	4 J	1 J	2 J	BDL	1,000
Chlorobenzene	BDL	BDL	3 J	BDL	BDL	BDL	51	54	BDL	BDL	BDL	12	BDL	100
Ethylbenzene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	10	BDL	50	BDL	700
Xylenes (total)	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	79	BDL	35	BDL	1,000
Total VOCs	BDL	BDL	3	BDL	BDL	1	63	67	18	151	24	126	9	
TIC														
Hydrocarbons	6 J	12 J	BDL	11 J	BDL	BDL	7 J	8 J	28 J	14 J	7 J	BDL	10 J	
Oxygenated hydrocarbons	BDL	26 J	BDL	BDL	BDL	8 J	18 J	18 J	44 J	79 J	BDL	BDL	BDL	
Alkylaromatic hydrocarbons	BDL	6 J	BDL	BDL	BDL	BDL	BDL	BDL	17 J	12 J	17 J	260 J	BDL	
Cyclic oxygenated hydrocarbons	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	
Oxygenated aromatics	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	7 J	220 J	BDL	
Amides and amines	7 J	13 J	BDL	5 J	BDL	BDL	BDL	BDL	BDL	BDL	5 J	BDL	BDL	
Halogenated aromatics	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	
PAHs	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	490 J	BDL	BDL	
Nitriles	BDL	BDL	BDL	BDL	BDL	BDL	9 J	8 J	5 J	BDL	BDL	BDL	BDL	
Heterocyclic aromatics	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	
Total TICs	13	57	BDL	16	BDL	8	34	34	94	105	526	480	10	

TABLE 5-[illegible] (Continued)

VOC CONCENTRATIONS IN GEOPROBE™ GROUNDWATER SAMPLES - CLP DATA
(Results in ppb)

VOC	C2200N	C800N	C400N	D3600N	D3000N	D1400N	D1600S	E2600N	E600N	E00	E600S	E1200S	F3600N	RAL
Chloroethane	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	--
Methylene chloride	BDL	31 UJ	BDL	10 UJ	10 UJ	BDL	BDL	BDL	10 UJ	BDL	10 UJ	12 UJ	BDL	50
Acetone	17 UJ	32 UJ	20 UJ	15 UJ	20 UJ	41 UJ	17 UJ	29 UJ	BDL	10 UJ	10 UJ	BDL	10 UJ	700
Carbon disulfide	1 J	2 J	1 J	1 J	3 J	1 J	2 J	3 J	BDL	BDL	BDL	BDL	2 J	700
1,1-DCE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	6
1,1-DCA	BDL	4 J	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	70
1,2-DCE(total)	BDL	12	BDL	BDL	BDL	BDL	BDL	BDL	BDL	7 J	BDL	BDL	BDL	--
2-Butanone	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	300
1,1,1-TCA	BDL	4 J	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	600
TCE	BDL	11	BDL	BDL	BDL	BDL	BDL	BDL	BDL	2 J	BDL	BDL	BDL	30
Benzene	8 J	12	8 J	6 J	8 J	2 J	13	6 J	10 UJ	10 UJ	10 UJ	12 UJ	14	10
4-Methyl-2-pentanone	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	300
2-Hexanone	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	--
Toluene	BDL	43	BDL	BDL	4 J	1 J	2 J	2 J	BDL	6 J	BDL	5 J	BDL	1,000
Chlorobenzene	4 J	BDL	BDL	15	BDL	BDL	BDL	BDL	1 J	2 J	3 J	11 J	BDL	100
Ethylbenzene	BDL	3 J	BDL	BDL	BDL	BDL	7 J	BDL	BDL	R	BDL	73	BDL	700
Xylenes (total)	19	15	BDL	BDL	35	BDL	5 J	28	1 J	32	8 J	300 J	12	10,000
Total VOCs	32	106	9	22	50	4	29	39	2	65	11	389	28	
TIC														
Hydrocarbons	8 J	36 J	7 J	80 J	750 J	17 J	BDL	26 J	BDL	BDL	BDL	BDL	BDL	
Oxygenated hydrocarbons	9 J	79 J	22 J	BDL	210 J	12 J	BDL	39 J	BDL	BDL	BDL	BDL	6 J	
Alkylaromatic hydrocarbons	7 J	BDL	6 J	300 J	9 J	BDL	6 J	BDL	BDL	BDL	BDL	63 J	56 J	
Cyclic oxygenated hydrocarbons	BDL	BDL	BDL	BDL	11 J	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	
Oxygenated aromatics	BDL	BDL	BDL	100 J	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	
Amides and amines	BDL	BDL	16 J	BDL	BDL	6 J	BDL	BDL	BDL	BDL	BDL	BDL	BDL	
Halogenated aromatics	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	15 J	BDL	
PAHs	BDL	BDL	BDL	BDL	BDL	BDL	20 J	BDL	BDL	BDL	BDL	BDL	BDL	
Nitriles	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	
Heterocyclic aromatics	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	
Total TICs	24	115	51	480	980	35	26	65	BDL	BDL	BDL	78	62	

TABLE 5-[illegible] (Continued)

VOC CONCENTRATIONS IN GEOPROBE™ GROUNDWATER SAMPLES - CLP DATA
(Results in ppb)

VOC	F3000N	F3000N-D	F2200N	F1600N	F1000N	F1600S	H2800N	H600N	H1600S	I1200N	I00	J2400N	J800N	RAL
Chloroethane	BDL	BDL	BDL	BDL	BDL	BDL	2 J	BDL	BDL	BDL	2 J	BDL	BDL	--
Methylene chloride	BDL	BDL	10 UJ	BDL	BDL	BDL	10 UJ	14 UJ	10 UJ	BDL	10 UJ	BDL	BDL	50
Acetone	77 UJ	28 UJ	52 UJ	BDL	15 UJ	20 UJ	BDL	BDL	26 UJ	19 UJ	40 UJ	23 UJ	32 UJ	700
Carbon disulfide	2 J	2 J	2 J	BDL	BDL	BDL	BDL	1 J	BDL	BDL	BDL	1 J	BDL	700
1,1-DCE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	6
1,1-DCA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	70
1,2-DCE(total)	10	14	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	--
2-Butanone	27 UJ	BDL	77 UJ	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	300
1,1,1-TCA	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	600
TCE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	30
Benzene	**12**	**12**	10	10	**16**	1 J	**11**	5	6 J	7 J	**60**	2 J	BDL	10
4-Methyl-2-pentanone	BDL	BDL	14	BDL	BDL	BDL	2 J	BDL	BDL	BDL	3 J	BDL	2 J	300
2-Hexanone	BDL	BDL	BDL	BDL	BDL	BDL	3 J	BDL	BDL	BDL	BDL	BDL	BDL	--
Toluene	16	21	6	BDL	BDL	BDL	BDL	1 J	1 J	BDL	7	BDL	BDL	1,000
Chlorobenzene	BDL	BDL	BDL	BDL	BDL	BDL	4 J	BDL	BDL	BDL	2 J	BDL	BDL	100
Ethylbenzene	44	55	8	BDL	BDL	BDL	BDL	BDL	BDL	BDL	31	BDL	BDL	700
Xylenes (total)	240	300	54	BDL	BDL	BDL	69	21	BDL	BDL	168	BDL	BDL	1,000
Total VOCs	324	404	94	10	16	1	91	28	7	7	273	3	2	
TIC														
Hydrocarbons	65 J	35 J	BDL	31 J	22 J	BDL	BDL	45 J	190 J	BDL	BDL	17 J	BDL	
Oxygenated hydrocarbons	62 J	46 J	55 J	57 J	8 J	23 J	BDL	BDL	BDL	14 J	BDL	30 J	BDL	
Alkylaromatic hydrocarbons	44 J	110 J	18 J	84 J	BDL	BDL	290 J	17 J	52 J	52 J	120 J	BDL	BDL	
Cyclic oxygenated hydrocarbons	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	
Oxygenated aromatics	BDL	BDL	BDL	BDL	BDL	BDL	24 J	BDL	BDL	BDL	BDL	BDL	BDL	
Amides and amines	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	58 J	9 J	BDL	5 J	6 J	
Halogenated aromatics	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	
PAHs	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	
Nitriles	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	
Heterocyclic aromatics	BDL	BDL	BDL	BDL	5 J	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	
Total TICs	171	191	73	172	35	23	314	62	300	75	120	52	6	

TABLE 5-[illegible] (Continued)

VOC CONCENTRATIONS IN GEOPROBE™ GROUNDWATER SAMPLES - CLP DATA
(Results in ppb)

VOC	J600S	J1400S	J1400S-D	K1600N	L1200N	RAL
Chloroethane	2 J	BDL	BDL	BDL	BDL	--
Methylene chloride	10 UJ	BDL	BDL	BDL	BDL	50
Acetone	51 UJ	23 UJ	19 UJ	20 UJ	32 UJ	700
Carbon disulfide	BDL	BDL	BDL	BDL	2 J	700
1,1-DCE	BDL	BDL	BDL	BDL	BDL	6
1,1-DCA	BDL	BDL	BDL	BDL	BDL	70
1,2-DCE(total)	BDL	BDL	BDL	BDL	BDL	--
2-Butanone	14 UJ	BDL	BDL	BDL	BDL	300
1,1,1-TCA	BDL	BDL	BDL	BDL	BDL	600
TCE	BDL	BDL	BDL	BDL	BDL	30
Benzene	21	9 J	11	3 J	22	10
4-Methyl-2-pentanone	BDL	7 J	BDL	BDL	BDL	300
2-Hexanone	BDL	BDL	BDL	BDL	BDL	--
Toluene	15	BDL	BDL	1 J	2 J	1,000
Chlorobenzene	1 J	BDL	4 J	BDL	27	100
Ethylbenzene	18	BDL	BDL	BDL	7 J	700
Xylenes (total)	106	BDL	BDL	BDL	46	10,000
Total VOCs	163	16	15	4	106	
TIC						
Hydrocarbons	BDL	6 J	BDL	13 J	BDL	
Oxygenated hydrocarbons	BDL	14 J	25 J	5 J	7 J	
Alkylaromatic hydrocarbons	49 J	55 J	72 J	BDL	70 J	
Cyclic oxygenated hydrocarbons	BDL	BDL	BDL	BDL	8 J	
Oxygenated aromatics	BDL	BDL	BDL	BDL	BDL	
Amides and amines	BDL	BDL	BDL	7 J	BDL	
Halogenated aromatics	BDL	BDL	BDL	BDL	BDL	
PAHs	BDL	BDL	BDL	BDL	BDL	
Nitriles	BDL	BDL	BDL	10 J	BDL	
Heterocyclic aromatics	BDL	BDL	BDL	BDL	BDL	
Total TICs	49	75	97	35	85	

TABLE 5-[illegible] (Continued)

VOC CONCENTRATIONS IN GEOPROBE™ GROUNDWATER SAMPLES - CLP DATA
(Results in ppb)

Notes:

[a] BDL = Below laboratory method detection limits

[b] -- = RAL not assigned to analyte

[c] UJ = Estimated quantitation limit

[d] J = Estimated concentration value

[e] **Shaded bold values** indicate that concentration exceeds RAL

TABLE 5-4

VOC CONCENTRATIONS IN GEOPROBE™ GROUNDWATER SAMPLES - CSL DATA
(Results in ppb)

Sample Number	Trichloro-fluoromethane	trans-1,2-DCE	1,1,1-TCA	TCE	PCE	Benzene	Toluene	Chloro-benzene	Ethyl-benzene	Total Xylenes	1,3-DCB	1,4-DCB	1,2-DCB
RAL	2,000	100	600	30	7	10	1,000	100	700	10,000	600	10	600
A-400N	BDL[a]	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
A-800N	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
B-2600N	BDL	BDL	BDL	BDL	BDL	2.05	BDL	BDL	BDL	BDL	BDL	BDL	BDL
B-1800N	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
B-1400N	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
B-00	BDL	BDL	BDL	BDL	BDL	8.73	BDL	47.3	BDL	3.70	BDL	BDL	BDL
B-400S	BDL	BDL	BDL	BDL	BDL	**18.5**[b]	BDL	2.82	BDL	2.94	BDL	BDL	BDL
B-800S	BDL	BDL	BDL	BDL	BDL	**41.1**	3.06	BDL	9.09	82.5	BDL	BDL	BDL
B-1200S	9.27	BDL	BDL	BDL	BDL	**25.6**	2.98	9.50	BDL	5.04	10.9	**25.0**	BDL
B-1600S	1.79	BDL	BDL	BDL	BDL	**29.1**	BDL	9.17	22.4	18.8	21.3	**46.4**	32.0
B-2000S	BDL	12.9	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
C-2200N	BDL	BDL	BDL	BDL	BDL	4.23	BDL	BDL	BDL	3.43	BDL	BDL	BDL
C-800N	BDL	BDL	BDL	BDL	BDL	6.27	BDL	2.25	BDL	BDL	BDL	BDL	BDL
C-400N	BDL	BDL	1.70	1.53	BDL	8.63	8.23	BDL	BDL	2.87	BDL	BDL	BDL
D-3600N	BDL	BDL	BDL	BDL	BDL	3.89	BDL	13.4	BDL	BDL	BDL	BDL	BDL
D-3000N	BDL	BDL	BDL	BDL	BDL	6.49	BDL	5.74	BDL	11.5	BDL	6.19	BDL
D-1400N	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
D-1600S	BDL	BDL	BDL	BDL	BDL	8.77	BDL	BDL	BDL	15.2	BDL	BDL	BDL
E-2600N	BDL	BDL	BDL	BDL	BDL	6.09	BDL	3.68	BDL	19.4	6.38	8.65	BDL
E-600N	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
E-00	BDL	BDL	BDL	BDL	BDL	5.20	3.13	BDL	4.99	12.0	BDL	BDL	BDL
E-600S	BDL	BDL	BDL	BDL	BDL	4.37	BDL	BDL	BDL	6.07	BDL	BDL	BDL
E-1200S	BDL	BDL	BDL	BDL	BDL	9.67	4.88	14.0	83.2	349	31.2	**70.0**	BDL
F-3600N	BDL	BDL	BDL	BDL	BDL	5.00	BDL	2.65	BDL	12.6	BDL	BDL	BDL
F-3000N	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
F-2200N	BDL	BDL	BDL	BDL	BDL	9.82	44.8	2.81	4.99	38.5	6.70	BDL	BDL
F-1600N	BDL	BDL	BDL	BDL	BDL	6.83	BDL	BDL	BDL	3.60	11.1	BDL	BDL

TABLE 5-[illegible] (Continued)

VOC CONCENTRATIONS IN GEOPROBE™ GROUNDWATER SAMPLES - CSL DATA
(Results in ppb)

Sample Number	Trichloro-fluoromethane	trans-1,2-DCE	1,1,1-TCA	TCE	PCE	Benzene	Toluene	Chloro-benzene	Ethyl-benzene	Total Xylenes	1,3-DCB	1,4-DCB	1,2-DCB
F-1000N	BDL	BDL	BDL	BDL	BDL	**10.4**	BDL	BDL	BDL	BDL	BDL	BDL	BDL
F-1600S	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
H-2800N	BDL	BDL	BDL	BDL	BDL	**12.6**	BDL	7.28	BDL	67.8	BDL	**61.5**	BDLS
H-600N	BDL	BDL	BDL	BDL	BDL	4.53	BDL	BDL	BDL	12.8	42.8	**17.2**	BDL
H-1600S	BDL	BDL	BDL	BDL	BDL	5.50	BDL	2.55	BDL	BDL	BDL	7.12	BDL
I-1200N	BDL	BDL	BDL	BDL	BDL	4.32	BDL	BDL	BDL	BDL	BDL	BDL	BDL
I-00	BDL	BDL	BDL	BDL	BDL	**69.3**	4.18	3.13	17.1	122	16.2	**97.2**	BDL
J-800N	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
J-600S	BDL	BDL	BDL	BDL	BDL	**27.9**	13.9	BDL	BDL	140	20.6	**40.1**	BDL
J-1400S	BDL	13.9	BDL	BDL	BDL	**10.1**	BDL	3.70	BDL	2.96	BDL	8.03	BDL
K-1600N	BDL	BDL	BDL	BDL	BDL	1.21	BDL	BDL	BDL	BDL	BDL	BDL	BDL
L-1200N	BDL	BDL	BDL	BDL	BDL	**17.0**	BDL	31.3	7.15	37.2	BDL	BDL	BDL

Notes:

a BDL = Below laboratory method detection limits

b **Shaded bold values** indicate that concentration exceeds RAL

TABLE 5-5

SVOC CONCENTRATIONS IN GEOPROBE™ GROUNDWATER SAMPLES
(Results in ppb)

SVOC	A800N	A400N	B2600N	B1800N	B1800ND	B1400N	B00	B00D	B400S	B800S	B1200S	B1600S	B2000S	C2200N	C400N	C800N	RAL
Phenol	BDL[a]	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	4,000
bis(2-Chloroethyl)ether	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0.3
1,4-DCB	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	3 J[b]	BDL	BDL	2 J	BDL	BDL	10
1,2-DCB	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	600
2-Methylphenol	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	30
bis(2-Chloroisopropyl)ether	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	300
4-Methylphenol	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	20 J	BDL	BDL	BDL	BDL	BDL	BDL	30
Nitrobenzene	BDL	BDL	BDL	2 J	BDL	BDL	BDL	BDL	BDL	BDL	3 J	BDL	BDL	BDL	BDL	BDL	3
Naphthalene	BDL	3 J	BDL	BDL	BDL	BDL	1 J	1 J	BDL	7 J	59[c]	350	BDL	BDL	BDL	BDL	30
2-Methylnaphthalene	BDL	6 J	BDL	BDL	BDL	BDL	3 J	3 J	1 J	6 J	13 J	44 J	BDL	BDL	2 J	1 J	--[d]
2,4,6-Trichlorophenol	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	30
2,4,5-Trichlorophenol	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	--
2-Chloronaphthalene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	--
Acenapthene	BDL	22	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	27 J	24 J	BDL	BDL	BDL	BDL	4,000
Phenanthrene	BDL	7 J	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	75	37 J	BDL	BDL	BDL	BDL	--
Dibenzofuran	BDL	5 J	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	14 J	BDL	BDL	BDL	BDL	BDL	--
Diethyl phthalate	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	50 UJ[e]	20 UJ	BDL	BDL	BDL	10 UJ	BDL	6,000
Fluorene	BDL	12	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	17 J	16 J	BDL	BDL	BDL	BDL	300
N-Nitrosodiphenylamine	BDL	BDL	BDL	16	14	1 J	2 J	2 J	BDL	BDL	BDL	BDL	BDL	BDL	3 J	BDL	70
Pentachlorophenol	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	200
Anthracene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	14 J	BDL	BDL	BDL	BDL	BDL	2,000
Carbazole	BDL	BDL	BDL	BDL	BDL	BDL	2 J	2 J	2 J	BDL	20	BDL	BDL	BDL	BDL	3 J	--
Di-n-butyl phthalate	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	10 UJ	BDL	700
Fluoranthene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	68	BDL	BDL	BDL	BDL	BDL	300
Pyrene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	41 J	BDL	BDL	BDL	BDL	BDL	200
Butyl benzyl phthalate	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	100
Benzo(a)anthracene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	16 J	BDL	BDL	BDL	BDL	BDL	--
Chrysene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	24	BDL	BDL	BDL	BDL	BDL	--
Di-n-octyl phthalate	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	--
bis(2-Ethylhexyl)phthalate	10 UJ	BDL	35 UJ	10 UJ	10 UJ	14 UJ	10 UJ	10 UJ	10 UJ	50 UJ	20 UJ	BDL	10 UJ	10 UJ	10 UJ	10 UJ	--
Benzo(b)fluoranthene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	17 J	BDL	BDL	BDL	BDL	BDL	--
Benzo(k)fluoranthene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	16 J	BDL	BDL	BDL	BDL	BDL	--
Benzo(a)pyrene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	18 J	BDL	BDL	BDL	BDL	BDL	--
Indeno(1,2,3-cd)pyrene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	13 J	BDL	BDL	BDL	BDL	BDL	--

TABLE 5-5 (Continued)

SVOC CONCENTRATIONS IN GEOPROBE™ GROUNDWATER SAMPLES
(Results in ppb)

SVOC	A800N	A400N	B2600N	B1800N	B1800ND	B1400N	B00	B00D	B400S	B800S	B1200S	B1600S	B2000S	C2200N	C400N	C800N	RAL
Dibenzo(a,h)anthracene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	5 J	BDL	BDL	BDL	BDL	BDL	--
Benzo(g,h,i)perylene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	14 J	BDL	BDL	BDL	BDL	BDL	--
Total SVOCs	BDL	55	BDL	18	14	1	8	8	3	33	477	471	BDL	2	5	4	
TIC																	
Hydrocarbons	BDL	BDL	24 J	13 J	25 J	10 J	BDL	8 J	BDL	54 J	BDL	1,130 J	BDL	36 J	BDL	BDL	
Oxygenated hydrocarbons	2 J	BDL	40 J	12 J	31 J	9 J	51 J	81 J	81 J	810 J	54 J	82 J	15 J	65 J	68 J	550 J	
Alkylaromatic hydrocarbons	2 J	BDL	5 J	BDL	BDL	BDL	9 J	18 J	14 J	22 J	17 J	81 J	BDL	24 J	14 J	63 J	
Cyclic oxygenated hydrocarbons	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	
Oxygenated aromatics	BDL	BDL	12 J	14 J	13 J	11 J	24 J	11 J	84 J	42 J	34 J	BDL	6 J	6 J	150 J	90 J	
Heterocyclic aromatics	2 J	BDL	10 J	50 J	40 J	10 J	130 J	92 J	32 J	25 J	19 J	21 J	10 J	17 J	BDL	36 J	
Phosphoric acid esters	BDL	BDL	BDL	6 J	5 J	5 J	45 J	38 J	21 J	BDL	24 J	BDL	8 J	13 J	BDL	26 J	
PAHs	14 J	20 J	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	27 J	360 J	2 J	BDL	8 J	BDL	
Sulfur	BDL	BDL	47 J	BDL	BDL	2 J	BDL	BDL	BDL	64 J	BDL	39 J	4 J	BDL	26 J	150 J	
Sulfonamides	BDL	BDL	9 J	15 J	5 J	10 J	46 J	42 J	38 J	20 J	24 J	BDL	10 J	18 J	52 J	17 J	
Amines and amides	BDL	BDL	BDL	9 J	2 J	4 J	10 J	10 J	BDL	570 J	BDL	BDL	BDL	8 J	8 J	BDL	
Halogenated aromatics	BDL	BDL	7 J	2 J	BDL	BDL	7 J	BDL	BDL	BDL	BDL	BDL	BDL	8 J	BDL	BDL	
Nitriles	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	
Miscellaneous	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	
Total TICs	20	20	154	121	121	61	322	300	270	1,607	199	1,713	55	195	326	932	

TABLE 5-5 (Continued)

SVOC CONCENTRATIONS IN GEOPROBE™ GROUNDWATER SAMPLES
(Results in ppb)

SVOC	D3600N	D3000N	D1600S	E2600N	E600N	E00	E600S	E1200S	F3600N	F3000N	F3000ND	F2200N	F1600N	F1000N	RAL
Phenol	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	4,000
bis(2-Chloroethyl)ether	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0.3
1,4-DCB	BDL	BDL	BDL	2 J	BDL	BDL	BDL	11 J	2 J	2 J	2 J	BDL	1 J	BDL	10
1,2-DCB	BDL	2 J	BDL	BDL	BDL	BDL	BDL	BDL	BDL	2 J	2 J	BDL	BDL	BDL	600
2-Methylphenol	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	30
bis(2-Chloroisopropyl)ether	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	1 J	BDL	300
4-Methylphenol	BDL	7 J	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	30
Nitrobenzene	BDL	BDL	BDL	5 J	BDL	BDL	BDL	BDL	4 J	BDL	BDL	BDL	12	21	3
Naphthalene	BDL	6 J	8 J	3 J	BDL	2 J	1 J	27	BDL	5 J	5 J	4 J	1 J	1 J	30
2-Methylnaphthalene	160	BDL	BDL	1 J	BDL	BDL	BDL	5 J	4 J	3 J	2 J	3 J	2 J	BDL	--
2,4,6-Trichlorophenol	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	30
2,4,5-Trichlorophenol	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	--
2-Chloronaphthalene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	3 J	BDL	BDL	--
Acenapthene	BDL	BDL	BDL	3 J	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	4,000
Phenanthrene	6 J	BDL	BDL	BDL	BDL	1 J	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	--
Dibenzofuran	4 J	BDL	BDL	1 J	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	--
Diethyl phthalate	BDL	BDL	BDL	10 UJ	BDL	BDL	10 UJ	BDL	BDL	10 UJ	10 UJ	24 UJ	10 UJ	11 UJ	6,000
Fluorene	7 J	BDL	BDL	2 J	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	300
N-Nitrosodiphenylamine	BDL	BDL	1 J	BDL	2 J	BDL	1 J	BDL	3 J	2 J	2 J	BDL	3 J	BDL	70
Pentachlorophenol	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	200
Anthracene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	2,000
Carbazole	BDL	BDL	2 J	BDL	1 J	BDL	2 J	BDL	BDL	BDL	BDL	BDL	1 J	BDL	--
Di-n-butyl phthalate	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	700
Fluoranthene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	300
Pyrene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	200
Butyl benzyl phthalate	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	10 UJ	10 UJ	BDL	BDL	BDL	100
Benzo(a)anthracene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	--
Chrysene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	--
Di-n-octyl phthalate	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	--
bis(2-Ethylhexyl)phthalate	40 UJ	BDL	10 UJ	10 UJ	10 UJ	10 UJ	10 UJ	BDL	10 UJ	10 UJ	10 UJ	BDL	10 UJ	13 UJ	--
Benzo(b)fluoranthene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	--
Benzo(k)fluoranthene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	--
Benzo(a)pyrene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	--

TABLE 5-5 (Continued)

SVOC CONCENTRATIONS IN GEOPROBE™ GROUNDWATER SAMPLES
(Results in ppb)

SVOC	D3600N	D3000N	D1600S	E2600N	E600N	E00	E600S	E1200S	F3600N	F3000N	F3000ND	F2200N	F1600N	F1000N	RAL
Indeno(1,2,3-cd)pyrene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	--
Dibenzo(a,h)anthracene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	--
Benzo(g,h,i)perylene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	--
Total SVOCs	177	15	11	17	3	3	4	43	13	14	13	10	21	22	
TIC															
Hydrocarbons	140 J	BDL	7 J	BDL	19 J	15 J	11 J	80 J	14 J	3 J	4 J	210 J	18 J	BDL	
Oxygenated hydrocarbons	46 J	58 J	23 J	270 J	70 J	360 J	56 J	180 J	120 J	270 J	140 J	220 J	77 J	66 J	
Alkylaromatic hydrocarbons	23 J	6 J	3 J	BDL	BDL	BDL	18 J	120 J	39 J	3 J	22 J	66 J	25 J	BDL	
Cyclic oxygenated hydrocarbons	BDL	8 J	BDL	14 J	BDL	BDL	BDL	100 J	BDL	BDL	BDL	19 J	BDL	BDL	
Oxygenated aromatics	BDL	130 J	27 J	42 J	10 J	12 J	33 J	14 J	390 J	20 J	BDL	140 J	11 J	140 J	
Heterocyclic aromatics	BDL	76 J	74 J	190 J	58 J	19 J	24 J	41 J	36 J	23 J	29 J	BDL	45 J	10 J	
Phosphoric acid esters	BDL	21 J	27 J	BDL	52 J	BDL	29 J	31 J	19 J	18 J	21 J	34 J	BDL	BDL	
PAHs	510 J	BDL	3 J	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	20 J	BDL	
Sulfur	52 J	BDL	3 J	96 J	16 J	31 J	9 J	BDL	20 J	BDL	BDL	BDL	46 J	73 J	
Sulfonamides	BDL	21 J	32 J	81 J	49 J	BDL	36 J	24 J	45 J	22 J	22 J	51 J	44 J	21 J	
Amines and amides	BDL	BDL	4 J	BDL	BDL	BDL	5 J	25 J	10 J	BDL	15 J	BDL	BDL	33 J	
Halogenated aromatics	BDL	5 J	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	33 J	
Nitriles	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	10 J	
Miscellaneous	BDL	BDL	BDL	BDL	7 J	BDL	BDL	BDL	BDL	50 J	35 J	BDL	BDL	BDL	
Total TICs	771	325	203	693	281	437	221	615	693	409	288	740	286	386	

TABLE 5-5 (Continued)

SVOC CONCENTRATIONS IN GEOPROBE™ GROUNDWATER SAMPLES
(Results in ppb)

SVOC	F1600S	H2800N	H600N	H1600S	I1200N	I00	J2400N	J800N	J600S	J1400S	J1400S-D	K1600N	L1200N	RAL
Phenol	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	2 J	BDL	BDL	4,000
bis(2-Chloroethyl)ether	BDL	BDL	BDL	BDL	BDL	4,000	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0.3
1,4-DCB	BDL	BDL	BDL	3 J	BDL	BDL	BDL	BDL	BDL	BDL	BDL	2 J	3 J	10
1,2-DCB	BDL	2 J	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	600
2-Methylphenol	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	1 J	BDL	8 J	BDL	BDL	30
bis(2-Chloroisopropyl)ether	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	300
4-Methylphenol	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	6 J	BDL	BDL	BDL	BDL	30
Nitrobenzene	BDL	BDL	BDL	BDL	14	BDL	23	BDL	2 J	BDL	BDL	11	5 J	3
Naphthalene	BDL	36	2 J	11	BDL	BDL	BDL	BDL	20	6 J	6 J	1 J	17	30
2-Methylnaphthalene	BDL	3 J	1 J	2 J	BDL	BDL	BDL	BDL	3 J	1 J	2 J	BDL	3 J	--
2,4,6-Trichlorophenol	BDL	BDL	1 J	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	30
2,4,5-Trichlorophenol	BDL	BDL	1 J	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	--
2-Chloronaphthalene	BDL	BDL	1 J	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	--
Acenapthene	BDL	BDL	BDL	3 J	BDL	BDL	BDL	BDL	2 J	BDL	BDL	BDL	BDL	4,000
Phenanthrene	BDL	BDL	BDL	9 J	BDL	BDL	BDL	BDL	1 J	BDL	BDL	BDL	BDL	--
Dibenzofuran	BDL	BDL	BDL	2 J	BDL	BDL	BDL	BDL	1 J	BDL	BDL	BDL	BDL	--
Diethyl phthalate	BDL	10 UJ	10 UJ	BDL	BDL	270 UJ	BDL	BDL	10 UJ	10 UJ	10 UJ	10 UJ	10 UJ	6,000
Fluorene	BDL	BDL	BDL	2 J	BDL	BDL	BDL	BDL	2 J	BDL	BDL	BDL	BDL	300
N-Nitrosodiphenylamine	BDL	2 J	6 J	2 J	BDL	BDL	BDL	BDL	BDL	1 J	1 J	2 J	2 J	70
Pentachlorophenol	BDL	BDL	50	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	200
Anthracene	BDL	BDL	BDL	2 J	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	2,000
Carbazole	BDL	BDL	BDL	5 J	BDL	BDL	BDL	BDL	3 J	2 J	2 J	BDL	BDL	--
Di-n-butyl phthalate	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	700
Fluoranthene	BDL	BDL	BDL	5 J	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	300
Pyrene	BDL	BDL	BDL	3 J	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	200
Butyl benzyl phthalate	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	100
Benzo(a)anthracene	BDL	BDL	BDL	1 J	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	--
Chrysene	BDL	BDL	BDL	2 J	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	--
Di-n-octyl phthalate	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	10 UJ	BDL	BDL	--
bis(2-Ethylhexyl)phthalate	BDL	10 UJ	10 UJ	10 UJ	BDL	BDL	BDL	BDL	10 UJ	10 UJ	16 UJ	10 UJ	10 UJ	--
Benzo(b)fluoranthene	BDL	BDL	BDL	1 J	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	--
Benzo(k)fluoranthene	BDL	BDL	BDL	1 J	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	--
Benzo(a)pyrene	BDL	BDL	BDL	1 J	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	--

TABLE 5-5 (Continued)

SVOC CONCENTRATIONS IN GEOPROBE™ GROUNDWATER SAMPLES (Results in ppb)

SVOC	F1600S	H2800N	H600N	H1600S	I1200N	I00	J2400N	J800N	J600S	J1400S	J1400S-D	K1600N	L1200N	RAL
Indeno(1,2,3-cd)pyrene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	--
Dibenzo(a,h)anthracene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	--
Benzo(g,h,i)perylene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	--
Total SVOCs	BDL	43	62	55	14	4,000	23	BDL	41	10	21	16	30	
TIC														
Hydrocarbons	BDL	7 J	20 J	BDL	3 J	BDL	12 J	9 J	17 J	BDL	43 J	10 J	12 J	
Oxygenated hydrocarbons	150 J	87 J	45 J	140 J	90 J	510 J	51 J	72 J	57 J	62 J	95 J	90 J	120 J	
Alkylaromatic hydrocarbons	BDL	130 J	22 J	27 J	BDL		BDL	8 J	93 J	48 J	42 J	22 J	130 J	
Cyclic oxygenated hydrocarbons	BDL	BDL	57 J	BDL	BDL	27 J	BDL	14 J	88 J	BDL	BDL	BDL	BDL	
Oxygenated aromatics	BDL	61 J	110 J	13 J	26 J	660 J	14 J	3 J	95 J	42 J	BDL	BDL	11 J	
Heterocyclic aromatics	BDL	11 J	65 J	38 J	5 J	BDL	17 J	5 J	45 J	43 J	37 J	35 J	29 J	
Phosphoric acid esters	BDL	88 J	150 J	49 J	BDL	89 J	9 J	BDL	56 J	30 J	23 J	BDL	BDL	
PAHs	BDL	7 J	60 J	6 J	BDL	BDL	BDL	7 J	BDL	BDL	15 J	BDL	12 J	
Sulfur	BDL	BDL	12 J	BDL	41 J	BDL	19 J	6 J	BDL	BDL	17 J	BDL	31 J	
Sulfonamides	BDL	23 J	BDL	30 J	BDL	110 J	13 J	BDL	140 J	39 J	47 J	23 J	32 J	
Amines and amides	BDL	36 J	BDL	6 J	50 J	78 J	33 J	BDL	BDL	6 J	BDL	60 J	BDL	
Halogenated aromatics	BDL	BDL	BDL	BDL	34 J	BDL	BDL	BDL	BDL	BDL	BDL	18 J	17 J	
Nitriles	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	
Miscellaneous	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	
Total TICs	150	450	541	309	249	1,474	168	124	591	270	319	258	394	

Notes:

a BDL = Below laboratory method detection limit
b J = Estimated concentration value
c **Shaded bold values** indicate that concentration exceeds RAL
d -- = RAL not assigned to analyte
e UJ = Estimated quantitation limit

TABLE 5-6

METAL CONCENTRATIONS IN GEOPROBE™ GROUNDWATER SAMPLES (Results in ppb)

Metal	A800N	A400N	B2600N	B1800N	B1800ND	B1400N	B00	B00-D	B400S	B800S	B1200S	RAL
Antimony	BDL[a]	BDL	BDL	BDL	83[b]	BDL	88.4	BDL	96.3	BDL	BDL	1
Arsenic	1.2 J[c]	1.5 J	BDL	BDL	BDL	BDL	BDL	BDL	1.3 J	BDL	BDL	0.2
Barium	242	323	363	490	481	574	413	421	822	424	617	2,000
Calcium	249,000	128,000	204,000	238,000	233,000	159,000	142,000	143,000	165,000	208,000	136,000	--[d]
Cobalt	BDL	BDL	BDL	BDL	7.2 J	BDL	BDL	BDL	BDL	BDL	BDL	1
Iron	57,200	64,700	24,200	25,200	24,800	32,600	54,800	53,300	50,000	79,000	73,000	--
Magnesium	51,100	31,700	69,300	107,000	100,000	66,200	70,800	70,000	64,200	50,300	32,200	--
Manganese	3,130	1,660	395	369	363	529	210	209	208	670	279	300
Mercury	0.10 J	0.15 J	0.39	BDL	BDL	0.2	BDL	BDL	BDL	BDL	BDL	1
Nickel	BDL	BDL	BDL	BDL	BDL	BDL	12.8 J	12.7 J	10.4 J	25.4 J	BDL	70
Potassium	51,000	40,900	32,500	47,700	46,200	28,800	74,000	74,900	63,200	25,000	13,500	--
Selenium	BDL	BDL	BDL	BDL	BDL	BDL	5.0 J	BDL	BDL	BDL	BDL	10
Silver	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	10
Sodium	147,000	58,100	54,300	88,500	87,200	60,600	268,000	270,000	98,100	39,700	19,500	--
Thallium	BDL	BDL	BDL	BDL	BDL	10.5 J	BDL	BDL	BDL	BDL	BDL	0.3
Vanadium	5.2 UJ[e]	BDL	8.7 J	7.1 J	9.3 J	7.8 J	6.2 J	BDL	BDL	BDL	BDL	20
Zinc	6.0 J	3.5 J	BDL	BDL	BDL	BDL	16.1 J	12.7 J	284	43.7 J	52.2	700
Cyanide	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	100

TABLE 5-6 (Continued)

METAL CONCENTRATIONS IN GEOPROBE™ GROUNDWATER SAMPLES
(Results in ppb)

Metal	B1600S	B2000S	C2200N	C800N	C400N	D3600N	D3000N	D1600S	E2600N	E600N	E00	E600S	E1200S	F3600N	RAL
Antimony	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	**93.9**	BDL	BDL	BDL	BDL	1
Arsenic	BDL	**2.1 J**	BDL	BDL	BDL	BDL	**1.9 J**	**3.9 J**	**1.3 J**	BDL	BDL	BDL	**7.9 J**	**1.2 J**	0.2
Barium	346	277	606	684	800	778	383	591	792	358	559	570	41.9 J	488	2000
Calcium	141,000	193,000	138,000	174,000	169,000	217,000	169,000	146,000	227,000	399,000	130,000	214,000	63,500	146,000	--
Cobalt	BDL	BDL	BDL	BDL	**7.4 J**	BDL	BDL	**14.4 J**	BDL	**8.3 J**	**8.3 J**	BDL	BDL	**11.8 J**	1
Iron	63,600	18,600	32,200	35,500	34,100	40,100	19,700	66,600	26,600	8,610	25,500	58,300	20,700	28,600	--
Magnesium	50,500	34,400	99,700	94,300	93,300	54,200	97,500	44,000	164,000	88,000	144,000	68,300	47,500	110,000	--
Manganese	193	**477**	91.6	141	166	**497**	**419**	206	**304**	**1,690**	142	**448**	105	204	300
Mercury	BDL	BDL	BDL	BDL	BDL	0.2	BDL	BDL	**6.4**	BDL	BDL	BDL	0.16 J	BDL	1
Nickel	BDL	9.2J	BDL	**79.5**	11.6 J	BDL	BDL	**251**	16.8 J	BDL	29.2 J	BDL	12.3 J	BDL	70
Potassium	41,900	2,000	90,600	66,900	70,000	32,600	59,000	28,200	160,000	59,500	271,000	42,200	25,100	109,000	--
Selenium	BDL	1.0 J	BDL	BDL	BDL	BDL	5.5 J	BDL	BDL	BDL	BDL	BDL	7.0 J	BDL	10
Silver	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	10
Sodium	52,600	32,300	109,000	12,500	199,000	54,400	106,000	39,500	360,000	180,000	726,000	69,600	1,060,000	125,000	--
Thallium	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0.3
Vanadium	BDL	BDL	8.1 J	8.2 J	5.2 J	BDL	BDL	BDL	6.2 UJ	6.1 J	5.3 J	6.4 J	BDL	BDL	20
Zinc	111	70.5	BDL	17.2 J	14.9 J	BDL	BDL	92.7	BDL	BDL	11.8 J	29.2	22.7	BDL	700
Cyanide	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	31.7	BDL	100

TABLE 5-6 (Continued)

METAL CONCENTRATIONS IN GEOPROBE™ GROUNDWATER SAMPLES
(Results in ppb)

Metal	F3000N	F3000ND	F2200N	F1600N	F1000N	F1600S	H2800N	H600N	H1600S	I00	I1200N	J2400N	J800N	RAL
Antimony	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	1
Arsenic	2.1 J	1.8 J	1.6 J	1.3 J	BDL	BDL	1.4 J	1.8 J	1.3 J	1.0 J	3.6 J	1.7 J	BDL	0.2
Barium	1,310	1,290	1,050	676	1,100	295	411	1,530	422	560	890	326	312	2,000
Calcium	161,000	161,000	130,000	144,000	266,000	168,000	169,000	217,000	142,000	308,000	121,000	138,000	345,000	--
Cobalt	36.0 J	32.0 J	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	1
Iron	68,500	70,400	26,800	43,500	44,300	46,500	35,400	34,600	51,900	146,000	29,900	15,500	5,450	--
Magnesium	73,100	74,900	161,000	107,000	89,000	43,400	120,000	83,500	67,500	142,000	176,000	196,000	51,100	--
Manganese	283	294	75	162	1,580	764	189	887	367	519	99.8	223	1,630	300
Mercury	BDL	BDL	BDL	BDL	0.14 J	BDL	BDL	0.11 J	BDL	0.2	BDL	BDL	BDL	1
Nickel	47.8	40.6	24.3 J	11.9 J	BDL	BDL	BDL	9.9 J	10.1 J	49.9	BDL	9.9 J	BDL	70
Potassium	96,500	97,500	203,000	103,000	51,000	21,000	87,000	105,000	39,500	62,400	118,000	139,000	80,300	--
Selenium	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	10
Silver	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	5.0 J	BDL	BDL	BDL	10
Sodium	138,000	139,000	816,000	156,000	35,400	127,000	241,000	23,000	150,000	165,000	167,000	289,000	29,000	--
Thallium	BDL	BDL	BDL	BDL	BDL	BDL	BDL	13 R[f]	BDL	BDL	BDL	BDL	BDL	0.3
Vanadium	7.5 UJ	BDL	BDL	BDL	10.6 J	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	20
Zinc	6.3 J	13.4 J	BDL	BDL	BDL	103	BDL	BDL	79.5	196	BDL	BDL	BDL	700
Cyanide	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	100

TABLE 5-6 (Continued)

METAL CONCENTRATIONS IN GEOPROBE™ GROUNDWATER SAMPLES (Results in ppb)

Metal	J600S	J1400S	J1400SD	K1600N	L1200N	RAL
Antimony	BDL	BDL	BDL	BDL	BDL	1
Arsenic	BDL	**1.2 J**	**1.0 J**	**1.2 J**	**2.1 J**	0.2
Barium	332	318	312	749	898	2,000
Calcium	228,000	151,000	149,000	64,100	115,000	--
Cobalt	BDL	BDL	BDL	BDL	BDL	1
Iron	102,000	43,900	42,600	8,870	53,200	--
Magnesium	36,700	74,900	73,200	181,000	126,000	--
Manganese	**516**	287	286	103	160	300
Mercury	BDL	BDL	BDL	BDL	BDL	1
Nickel	12.9 J	18.9 J	18.8 J	BDL	9.2 J	70
Potassium	66,900	51,600	50,900	197,000	122,000	--
Selenium	BDL	BDL	BDL	BDL	BDL	10
Silver	BDL	BDL	BDL	BDL	BDL	10
Sodium	102,000	148,000	149,000	178,000	715,000	--
Thallium	BDL	BDL	BDL	BDL	BDL	0.3
Vanadium	5.8 J	BDL	6.0 J	BDL	BDL	20
Zinc	45.2	115	65.3	BDL	BDL	700
Cyanide	BDL	BDL	BDL	BDL	BDL	100

Notes:

a BDL = Below detection limit
b **Shaded bold values** indicate that concentration exceed RAL
c J = Estimated concentration value
d -- = RAL not assigned to analyte
e UJ = Estimated quantitation limit
f R = Rejected

TABLE 5-7

PESTICIDE CONCENTRATIONS IN GEOPROBE™ GROUNDWATER SAMPLES
(Results in ppb)

Pesticide	A800N	A400N	B2600N	B1800N	B1800ND	B1400N	B00	B00D	B400S	B800S	B1200S	B1600S	B2000S
delta-BHC	BDL[a]	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Alpha chlordane	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0.039J[b]	BDL	BDL	BDL	BDL	BDL
Gamma chlordane	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0.047 J	0.026 J	BDL	BDL	BDL	BDL
4,4'-DDT	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
4,4'-DDD	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0.089 J	BDL	BDL	BDL	BDL

Pesticide	C2200N	C800N	C400N	D3600N	D3000N	D1600S	E2600N	E600N	E00	E600S	E1200S	F3600N
delta-BHC	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0.14 J	BDL
Alpha chlordane	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Gamma chlordane	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
4,4'-DDT	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
4,4'-DDD	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

Pesticide	F3000N	F3000ND	F2200N	F1600N	F1000N	F1600S	H2800N	H600N	H1600S	I1200N	I00
delta-BHC	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Alpha chlordane	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Gamma chlordane	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
4,4'-DDT	0.54	0.17	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
4,4'-DDD	1.3	0.56	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

TABLE 5-7 (Continued)

PESTICIDE CONCENTRATIONS IN GEOPROBE™ GROUNDWATER SAMPLES
(Results in ppb)

Pesticide	J2400N	J800N	J600S	J1400S	J1400SD	K1600N	L1200N
delta-BHC	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Alpha chlordane	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Gamma chlordane	BDL	BDL	BDL	BDL	BDL	BDL	BDL
4,4'-DDT	BDL	BDL	BDL	BDL	BDL	BDL	BDL
4,4'-DDD	BDL	BDL	BDL	BDL	BDL	BDL	BDL

Notes:

a BDL = Below laboratory method detection limits

b J = Estimated concentration value

TABLE 5-8

PCB CONCENTRATIONS IN GEOPROBE™ GROUNDWATER SAMPLES
(Results in ppb)

PCB	A800N	A400N	B2600N	B1800N	B1800ND	B1400N	B00	B00-D	B400S	B800S	B1200S	B1600S	B2000S
Aroclor 1221	BDL[a]	BDL	5.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Aroclor 1242	BDL	BDL	BDL	BDL	BDL	BDL	0.61J[b]	0.95 J	BDL	0.65 J	BDL	2.0	BDL
Aroclor 1254	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Aroclor 1260	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

PCB	C2200N	C800N	C400N	D3600N	D3000N	D1600S	E2600N	E600N	E00	E600S	E1200S	F3600N
Aroclor 1221	1.7 J	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Aroclor 1242	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Aroclor 1254	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Aroclor 1260	BDL	BDL	BDL	0.86 J	BDL	BDL	BDL	BDL	BDL	BDL	6.7	BDL

PCB	F3000N	F3000ND	F2200N	F1600N	F1000N	F1600S	H2800N	H600N	H1600S	I1200N	I00	J2400N
Aroclor 1221	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Aroclor 1242	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0.95 J	BDL	BDL	BDL
Aroclor 1254	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Aroclor 1260	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

PCB	J800N	J600S	J1400S	J1400SD	K1600N	L1200N
Aroclor 1221	BDL	BDL	BDL	BDL	BDL	BDL
Aroclor 1242	BDL	BDL	0.80 J	0.51 J	BDL	1.1
Aroclor 1254	BDL	BDL	BDL	BDL	BDL	0.72 J
Aroclor 1260	BDL	BDL	BDL	BDL	BDL	BDL

Notes:

a BDL = Below laboratory method detection limit

b J = Estimated concentration value

TABLE 5-9

VOC CONCENTRATIONS IN GROUNDWATER MONITORING WELL SAMPLES
(Results in ppb)

VOC	MW-1	MW-2	MW-4	MW-5	MW-6	MW-7	MW-7D	MW-8	RAL
Chloroethane	5 J[a]	BDL[b]	5 J	BDL	BDL	BDL	BDL	BDL	--[c]
Acetone	16 UJ[d]	16 UJ	45 UJ	10 UJ	45 UJ	24 UJ	16 UJ	410 UJ	700
Carbon disulfide	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	700
Chloroform	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	60
2-Butanone	BDL	BDL	11 UJ	12 UJ	BDL	10 UJ	BDL	BDL	300
Bromodichloromethane	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	3
Benzene	53[e]	5 J	11	BDL	20	8 J	7 J	15 J	10
4-Methyl-2-pentanone	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	300
Toluene	BDL	BDL	BDL	BDL	10 UJ	BDL	BDL	BDL	1,000
Chlorobenzene	5 J	BDL	3 J	BDL	26	15	17	16 J	100
Ethylbenzene	BDL	BDL	BDL	BDL	8 J	BDL	BDL	5 J	700
Xylenes (total)	6 J	BDL	1 J	BDL	24	4 J	3 J	120	10,000
Total VOCs	69	5	20	BDL	78	27	27	156	
TICs									
Hydrocarbons	14 J	BDL	BDL	BDL	BDL	BDL	BDL	BDL	
Oxygenated hydrocarbons	9 J	75 J	20 J	50 J	BDL	BDL	BDL	BDL	
Alkylaromatic hydrocarbons	31 J	BDL	6 J	BDL	25 J	14 J	28 J	25 J	
Cyclic oxygenated hydrocarbons	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	
Oxygenated aromatics	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	
Amides and amines	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	
Halogenated aromatics	12 J	BDL	5 J	BDL	6 J	5 J	BDL	BDL	
PAHs	BDL	6 J	BDL	BDL	22 J	10 J	10 J	BDL	
Nitriles	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	
Heterocyclic aromatics	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	
Unknowns	23 J	7 J	BDL	BDL	BDL	BDL	BDL	BDL	
Total TICs	89	88	31	50	53	29	38	25	

TABLE 5-9 (Continued)

VOC CONCENTRATIONS IN GROUNDWATER MONITORING WELL SAMPLES
(Results in ppb)

VOC	MW-9	MW-10	MW-11	MW-12	MW-13	MW-14	MW-14 D	MW-15	RAL
Chloroethane	3 J	BDL	BDL	BDL	BDL	BDL	BDL	BDL	--
Acetone	11 UJ	15 UJ	10 UJ	10 UJ	10 UJ	BDL	15 UJ	10 UJ	700
Carbon disulfide	BDL	10 UJ	BDL	BDL	BDL	BDL	BDL	10 UJ	700
Chloroform	BDL	BDL	BDL	BDL	BDL	BDL	1 J	16	60
2-Butanone	BDL	BDL	BDL	BDL	BDL	BDL	BDL	10 UJ	300
Bromodichloromethane	BDL	BDL	BDL	BDL	BDL	BDL	BDL	2 J	3
Benzene	25	7 J	BDL	10	15	BDL	BDL	BDL	10
4-Methyl-2-pentanone	BDL	BDL	BDL	BDL	2 J	BDL	BDL	BDL	300
Toluene	10 UJ	BDL	BDL	BDL	10 UJ	BDL	BDL	10 UJ	1,000
Chlorobenzene	1 J	2 J	BDL	3 J	54	BDL	BDL	BDL	100
Ethylbenzene	1 J	BDL	BDL	BDL	BDL	BDL	BDL	BDL	700
Xylenes (total)	45	3 J	BDL	1 J	2 J	BDL	BDL	BDL	10,000
Total VOCs	75	12	BDL	14	73	BDL	1	18	
TICs									
Hydrocarbons	33 J	BDL	BDL	BDL	BDL	BDL	BDL	BDL	
Oxygenated hydrocarbons	18 J	BDL	BDL	BDL	BDL	BDL	BDL	BDL	
Alkylaromatic hydrocarbons	24 J	BDL	BDL	13 J	17 J	BDL	BDL	BDL	
Cyclic oxygenated hydrocarbons	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	
Oxygenated aromatics	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	
Amides and amines	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	
Halogenated aromatics	BDL	BDL	BDL	BDL	10 J	BDL	BDL	BDL	
PAHs	BDL	BDL	BDL	8 J	19 J	BDL	BDL	BDL	
Nitriles	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	
Heterocyclic aromatics	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	
Total TICs	75	BDL	BDL	21	46	BDL	BDL	BDL	

TABLE 5-9 (Continued)

VOC CONCENTRATIONS IN GROUNDWATER MONITORING WELL SAMPLES
(Results in ppb)

Notes:

[a] J = Estimated concentration value

[b] BDL = Below laboratory method detection limits

[c] -- = RAL not assigned to analyte

[d] UJ = Estimated quantitation limit

[e] **Shaded bold values** indicate that concentration exceeds RAL

TABLE 5-10

SVOC CONCENTRATIONS IN GROUNDWATER MONITORING WELL SAMPLES (Results in ppb)

SVOC	MW-1	MW-2	MW-4	MW-5	MW-6	MW-7	MW-7D	MW-8	RAL
1,4-DCB	7 J[a]	BDL[b]	BDL	BDL	BDL	BDL	BDL	BDL	10
4-Methylphenol	BDL	BDL	22	BDL	BDL	BDL	BDL	28	30
Nitrobenzene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	3
Naphthalene	3 J	BDL	BDL	BDL	BDL	BDL	BDL	16	30
2-Methylnaphthalene	BDL	BDL	BDL	BDL	BDL	2 J	BDL	4 J	--[c]
Acenapthene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	2 J	4,000
Phenanthrene	BDL	BDL	BDL	BDL	BDL	1 J	BDL	3 J	--
Dibenzofuran	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	--
Diethyl phthalate	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	6,000
N-Nitrosodiphenylamine	BDL	BDL	BDL	BDL	2 J	BDL	BDL	BDL	70
Anthracene	BDL	BDL	BDL	BDL	1 J	BDL	BDL	BDL	2,000
Di-n-butyl phthalate	10 UJ[d]	BDL	BDL	BDL	BDL	BDL	BDL	10 UJ	700
Butyl benzyl phthalate	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	100
Di-n-octyl phthalate	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	--
bis(2-Ethylhexyl)phthalate	10 UJ	12 UJ	10 UJ	BDL	10 UJ	BDL	BDL	10 UJ	--
Total SVOCs	10	BDL	22	BDL	3	2	BDL	53	
TICs									
Hydrocarbons	BDL	BDL	BDL	BDL	10 J	BDL	BDL	BDL	
Oxygenated hydrocarbons	72 J	256 J	39 J	6 J	11 J	8 J	26 J	249 J	
Alkylaromatic hydrocarbons	BDL	BDL	34 J	BDL	11 J	BDL	BDL	259 J	
Oxygenated aromatics	13 J	BDL	32 J	3 J	46 J	91 J	43 J	24 J	
Heterocyclic aromatics	291 J	BDL	12 J	4 J	29 J	BDL	44 J	39 J	
Phosphoric acid esters	80 J	BDL	22 J	BDL	10 J	10 J	BDL	BDL	
PAHs	BDL	BDL	BDL	BDL	15 J	7 J	BDL	BDL	
Sulfur	BDL	BDL	25 J	11J	BDL	19 J	14 J	BDL	
Sulfonamides	99 J	12 J	13 J	BDL	12 J	17 J	16 J	18 J	

TABLE 5-10 (Continued)

SVOC CONCENTRATIONS IN GROUNDWATER MONITORING WELL SAMPLES
(Results in ppb)

SVOC	MW-1	MW-2	MW-4	MW-5	MW-6	MW-7	MW-7D	MW-8	RAL
Amines and amides	BDL	BDL	35 J	71 J	BDL	BDL	BDL	BDL	
Halogenated aromatics	11 J	14 J	BDL	BDL	BDL	BDL	BDL	BDL	
Unknowns	263 J	90 J	79 J	56 J	67 J	79 J	102 J	204 J	
Total TICs	829	372	291	151	211	231	245	793	

SVOC	MW-9	MW-10	MW-11	MW-12	MW-13	MW-14	MW-14D	MW-15	RAL
1,4-DCB	BDL	BDL	BDL	BDL	4 J	BDL	BDL	BDL	10
4-Methylphenol	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	30
Nitrobenzene	BDL	BDL	BDL	BDL	3 J	BDL	BDL	BDL	3
Naphthalene	3 J	BDL	BDL	BDL	8 J	BDL	BDL	BDL	30
2-Methylnaphthalene	BDL	BDL	BDL	BDL	3 J	BDL	BDL	BDL	--
Acenapthene	BDL	2 J	BDL	BDL	2 J	BDL	BDL	BDL	4,000
Phenanthrene	BDL	BDL	BDL	BDL	2 J	BDL	BDL	BDL	--
Dibenzofuran	BDL	1 J	BDL	BDL	BDL	BDL	BDL	BDL	--
Diethyl phthalate	10 UJ	BDL	BDL	BDL	BDL	BDL	BDL	BDL	6,000
N-Nitrosodiphenylamine	BDL	BDL	BDL	3 J	BDL	BDL	BDL	BDL	70
Anthracene	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	2,000
Di-n-butyl phthalate	BDL	10 UJ	10 UJ	10 UJ	10 UJ	BDL	BDL	BDL	700
Butyl benzyl phthalate	BDL	10 UJ	BDL	BDL	BDL	BDL	BDL	BDL	100
Di-n-octyl phthalate	BDL	BDL	BDL	BDL	BDL	BDL	BDL	10 UJ	--
bis(2-Ethylhexyl)phthalate	15 UJ	BDL	10 UJ	10 UJ	10 UJ	10 UJ	10 UJ	10 UJ	--
Total SVOCs	3	3	BDL	3	22	BDL	BDL	BDL	
TICs									
Hydrocarbons	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	

TABLE 5-10 (Continued)

SVOC CONCENTRATIONS IN GROUNDWATER MONITORING WELL SAMPLES
(Results in ppb)

SVOC	MW-9	MW-10	MW-11	MW-12	MW-13	MW-14	MW-14D	MW-15	RAL
Oxygenated hydrocarbons	218 J	14 J	59 J	BDL	39 J	BDL	BDL	BDL	
Alkylaromatic hydrocarbons	15 J	BDL	BDL	BDL	6 J	BDL	BDL	BDL	
Oxygenated aromatics	156 J	28 J	43 J	40 J	19 J	BDL	BDL	BDL	
Heterocyclic aromatics	377 J	98 J	23 J	80 J	44 J	BDL	BDL	BDL	
Phosphoric acid esters	23 J	BDL	BDL	18 J	24 J	BDL	BDL	BDL	
PAHs	BDL	BDL	9 J	BDL	BDL	BDL	BDL	BDL	
Sulfur	BDL	21 J	12 J	BDL	BDL	BDL	BDL	BDL	
Sulfonamides	22 J	BDL	BDL	14 J	14 J	BDL	BDL	BDL	
Amines and amides	73 J	118 J	BDL	121 J	BDL	BDL	BDL	4 J	
Halogenated aromatics	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	
Unknowns	236 J	164 J	45 J	88 J	78 J	21 J	134 J	15 J	
Total TICs	1,120	443	191	361	224	21	134	19	

Notes:

a J = Estimated concentration value

b BDL = Below laboratory method detection limits

c -- = RAL not assigned to analyte

d UJ = Estimated quantitation limit

TABLE 5-11

METAL CONCENTRATIONS IN GROUNDWATER MONITORING WELL SAMPLES
(Results in ppb)

Metal	MW-1	MW-2	MW-4	MW-5	MW-6	MW-7	MW-7DUP	MW-8	RAL
Aluminum	BDL[a]	BDL	BDL	105 UJ	BDL	BDL	BDL	BDL	--[b]
Antimony	**32.4 J**[c,d]	BDL	**39.5 J**	BDL	BDL	BDL	**49.6 J**	BDL	1
Arsenic	4.2 UJ[e]	9.4 UJ	5.0 UJ	3.0 UJ	6.0 UJ	BDL	BDL	1.8 UJ	0.2
Barium	267	519	613	152	702	451	452	421	2,000
Beryllium	0.43 UJ	0.42 UJ	0.56 UJ	0.42 UJ	0.35 UJ	BDL	BDL	BDL	0.08
Calcium	481,000	360,000	332,000	88,700	129,000	156,000	156,000	153,000	--
Chromium	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	100
Cobalt	BDL	**6.1 J**	**9.3 J**	BDL	**10.1 J**	**5.2 J**	**4.4 J**	**4.2 J**	1
Copper	18.2 UJ	17.6 UJ	11.8 UJ	19.9 UJ	13.4 UJ	2.1 UJ	2.1 UJ	2.1 UJ	1,000
Iron	6,570	28,200	1,730	1,350	18,400	116 UJ	131 UJ	472	--
Lead	BDL	BDL	BDL	BDL	BDL	1.6 UJ	BDL	BDL	20
Magnesium	231,000	123,000	96,600	259,000	156,000	161,000	162,000	128,000	--
Manganese	**621 J**	**3,820 J**	**1,930 J**	150 J	**538 J**	270 J	265 J	**694 J**	300
Nickel	16.4 UJ	25.0 UJ	13.7 UJ	BDL	17.0 UJ	BDL	BDL	BDL	70
Potassium	77,100	3,780 UJ	65,900	154,000	129,000	97,800	96,800	95,400	--
Selenium	**22.7**	**18.5**	**23.9**	4.4 J	2.8 J	**25.4**	**24.4**	**23.2**	10
Sodium	191,000 J	174,000 J	88,400 J	283,000 J	180,000 J	159,000 J	161,000 J	138,000 J	--
Thallium	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0.3
Vanadium	28.0 UJ	29.3 UJ	22.3 UJ	19.2 UJ	21.7 UJ	5.6 UJ	6.6 UJ	5.9 UJ	20
Zinc	60.2 UJ	12.9 UJ	7.6 UJ	527 J	37.4 UJ	47.0 UJ	5.2 UJ	54.0 UJ	700
Cyanide	BDL	60.5 J	BDL	BDL	1.5 UJ	16.3 J	1.9 UJ	1.6 UJ	100

TABLE 5-11 (Continued)

METAL CONCENTRATIONS IN GROUNDWATER MONITORING WELL SAMPLES
(Results in ppb)

Metal	MW-9	MW-10	MW-11	MW-12	MW-13	MW-14	MW-14DUP	MW-15	RAL
Aluminum	36.8 UJ	BDL	BDL	62.5 UJ	374	BDL	BDL	60.9 UJ	--
Antimony	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	1
Arsenic	BDL	5.0 UJ	1.9 UJ	2.3 UJ	BDL	BDL	BDL	2.9 UJ	0.2
Barium	683	395	750	460	522	130 J	130 J	8.3 UJ	2,000
Beryllium	0.69 UJ	0.42 UJ	0.42 UJ	0.41 UJ	0.41 UJ	0.27 UJ	BDL	BDL	0.08
Calcium	240,000	221,000	192,000	168,000	151,000	79,300	77,900	27,500	--
Chromium	5.3 J	BDL	BDL	8.8 J	3.3 J	BDL	BDL	4.8 J	100
Cobalt	**6.0 J**	BDL	**3.6 J**	**4.1 J**	**9.6 J**	BDL	BDL	BDL	1
Copper	21.4 UJ	12.3 UJ	12.2 UJ	21.6 UJ	44.6 UJ	12.2 UJ	9.9 UJ	12.1 UJ	1,000
Iron	69,600	9,850	13,400	28,300	42,900	596	600	28.5 UJ	--
Lead	BDL	3.7 UJ	BDL	BDL	BDL	BDL	BDL	BDL	20
Magnesium	203,000	118,000	71,400	72,800	51,800	29,200	28,400	3,200 J	--
Manganese	**787 J**	**988 J**	**1,830 J**	**349 J**	**2,110 J**	**348 J**	**356 J**	29.0 J	300
Nickel	16.0 UJ	BDL	BDL	BDL	35.1 UJ	BDL	BDL	**136**	70
Potassium	90,100	74,300	38,300	68,700	39,900	BDL	2,940 UJ	5,080 UJ	--
Selenium	BDL	7.1	**13.6**	BDL	2.2 J	BDL	BDL	BDL	10
Sodium	143,000 J	103,000 J	63,900 J	88,200 J	64,300 J	9,690 J	9,310 J	15,000 J	--
Thallium	BDL	BDL	BDL	BDL	BDL	BDL	BDL	**5.5 J**	0.3
Vanadium	31.3 J	22.9 UJ	19.1 UJ	23.8 UJ	21.6 UJ	15.3 UJ	15.8 UJ	16.7 UJ	20
Zinc	60.6 UJ	81.8 UJ	3.8 UJ	228 UJ	**886**	BDL	5.7 UJ	100 UJ	700
Cyanide	BDL	5.3 J	BDL	1.5 UJ	2.9 UJ	BDL	BDL	4.7 J	100

Notes:

a BDL = Below laboratory method detection limits

b -- = RAL not assigned to analyte

c J = Estimated concentration value

d **Shaded bold values** indicate that concentration exceeds RAL

e UJ = Estimated quantitation limit

TABLE 5-12

VOC CONCENTRATIONS IN SURFACE WATER SAMPLES

(Results in ppb)

VOC	I00S	I00S-D	K600N	E1600S	A1000S	H1800S
Methylene chloride	BDL[a]	10 UJ[b]	10 UJ	10 UJ	10 UJ	10UJ
Acetone	10 UJ	22 UJ	10 UJ	13 UJ	10 UJ	10 UJ
1,2-DCA	1 J[c]	BDL	BDL	BDL	BDL	BDL
2-Butanone	BDL	BDL	BDL	10 UJ	BDL	BDL
Benzene	BDL	1 J	BDL	5 J	BDL	4 J
2-Hexanone	10 UJ	BDL	10 UJ	10 UJ	BDL	BDL
Chlorobenzene	BDL	BDL	BDL	2 J	BDL	2 J
Styrene	1 J	1 J	BDL	BDL	BDL	BDL
Xylenes (total)	BDL	BDL	BDL	3 J	BDL	BDL
Total VOCs	2	2	BDL	10	BDL	6
TICs						
Unknowns	BDL	BDL	BDL	BDL	BDL	9
Total TICs	BDL	BDL	BDL	BDL	BDL	9

Notes:

a BDL = Below laboratory method detection limit

b UJ = Estimated quantitation limit

c J = Estimated concentration value

TABLE 5-13

SVOC CONCENTRATIONS IN SURFACE WATER SAMPLES
(Results in ppb)

SVOC	I00S	I00S-D	K600N	E1600S	A1000S	H1800S
1,4-DCB	BDL[a]	BDL	BDL	BDL	BDL	1 J[b]
Phenanthrene	BDL	BDL	BDL	2 J	BDL	BDL
Carbazole	BDL	BDL	BDL	BDL	BDL	2 J
Fluoranthene	BDL	BDL	BDL	3 J	BDL	BDL
Pyrene	BDL	BDL	BDL	2 J	BDL	BDL
Benzo(a)anthracene	BDL	BDL	BDL	1 J	BDL	BDL
Chrysene	BDL	BDL	BDL	2 J	BDL	BDL
bis(2-Ethylhexyl)phthalate	10 UJ[c]	10 UJ	10 UJ	10 UJ	10 UJ	10 UJ
Di-n-butyl phthalate	BDL	BDL	BDL	BDL	BDL	10 UJ
Dimethyl phthalate	BDL	10 UJ	BDL	10 UJ	BDL	10 UJ
Benzo(b)fluoranthene	BDL	BDL	BDL	2 J	BDL	BDL
Benzo(a)pyrene	BDL	BDL	BDL	1 J	BDL	BDL
Total SVOCs	BDL	BDL	BDL	13	BDL	3
TICs						
Hydrocarbons	BDL	BDL	18 J	130 J	4 J	6 J
Oxygenated hydrocarbons	11 J	41 J	BDL	600 J	3 J	64 J
Oxygenated aromatics	BDL	2 J	BDL	11 J	BDL	31 J
Heterocyclic aromatics	10 J	17 J	5 J	BDL	3 J	41 J
Phosphoric acid esters	BDL	4 J	BDL	12 J	BDL	BDL
Sulfonamides	BDL	3 J	2 J	9 J	BDL	14 J
Amines and amides	BDL	BDL	BDL	BDL	2 J	19 J
Total TICs	21	67	25	762	12	175

Notes:

a BDL = Below laboratory method detection limits

b J = Estimated concentration value

c UJ = Estimated quantitation limit

TABLE 5-14

METAL CONCENTRATIONS IN SURFACE WATER SAMPLES
(Results in ppb)

Metal	E1600S	K600N	I00	I00-D	A1000S	H1800S	AWQC
Aluminum	7,520	55.7 J[a]	132 J	144 J	169 J	439	--[b]
Arsenic	16.7	2.0 J	2.2 J	2.2 J	13.2	2.2 J	190
Barium	2,300 J	108 J	112 J	119 J	238 J	123 J	--
Beryllium	2.4 J	BDL[c]	1.2 J	BDL	1.2 J	BDL	--
Cadmium	**52.6**[d]	BDL	BDL	BDL	BDL	BDL	1.1
Calcium	290,000 J	30,800 J	52,800 J	53,800 J	133,000 J	55,300 J	--
Chromium	35.6	BDL	BDL	BDL	BDL	BDL	--
Cobalt	22.0 J	BDL	BDL	BDL	4.9 J	BDL	--
Copper	**997**	BDL	BDL	BDL	BDL	BDL	12
Iron	**260,000 J**	**2,990 J**	**6,370 J**	**7,300 J**	**11,600 J**	**5,020 J**	1,000
Lead	**36.2 J**	1.2 J	3.1 J	3.0 J	**5.4 J**	**10.2 J**	3.2
Magnesium	52,100 J	40,600 J	24,400 J	25,700 J	42,500 J	24,100 J	--
Manganese	2,710 J	61.5 J	266 J	254 J	1,340 J	326 J	--
Mercury	**0.16 J**	BDL	BDL	BDL	BDL	BDL	0.012
Nickel	**256**	BDL	BDL	BDL	BDL	BDL	160
Potassium	18,100 J	37,300 J	9,000 J	10,500 J	87,500 J	8,390 J	--
Selenium	BDL	BDL	2.1 J	BDL	BDL	BDL	36
Sodium	30,400 J	72,200 J	63,500 J	62,800 J	190,000 J	67,200 J	--
Vanadium	69.3	BDL	BDL	BDL	BDL	BDL	--
Zinc	**9,710 J**	BDL	BDL	BDL	BDL	BDL	110
Cyanide	BDL	BDL	**13.0 J**	BDL	**37.0 J**	**26.4 J**	5.2

Notes:

a J = Estimated concentration limit
b -- = AWQC not assigned to analyte
c BDL = Below laboratory method detection limits
d **Shaded bold values** indicate that concentration exceeds AWQC

TABLE 5-15

VOC CONCENTRATIONS IN SEDIMENT SAMPLES COLLECTED 5/5/94
(Results in ppb)

VOC	F1400S	K600N	I00	L1200S	L1200S-D	J1400S	TCLP x 20
Chloromethane	5 J[a]	BDL[b]	BDL	BDL	BDL	BDL	--[c]
Methylene chloride	22 UJ[d]	42 UJ	15 UJ	14 UJ	17 UJ	26 UJ	--
Acetone	190 UJ	230 UJ	31 UJ	51 UJ	100 UJ	190 UJ	--
2-Butanone	42 UJ	48 UJ	BDL	14 UJ	18 UJ	40 UJ	4,000,000
Chlorobenzene	5 J	BDL	BDL	BDL	BDL	BDL	2,000,000
Toluene	BDL	BDL	BDL	101 J	180 J	BDL	--
Xylenes (total)	5 J	BDL	BDL	BDL	BDL	BDL	--
Total VOCs	15	0	0	101	180	0	--

Notes:

a J = Estimated concentration value
b BDL = Below laboratory method detection limits
c -- = TCLP limit not assigned to analyte
d UJ = Estimated quantitation limit

TABLE 5-16

VOC CONCENTRATIONS IN SEDIMENT SAMPLES COLLECTED 09/14/94
(Results in ppb)

VOC	SED-1	SED-1-DUP	SED-2	TCLP x 20
Methylene chloride	59 UJ	43 UJ	29 UJ	--[b]
Acetone	150 UJ	71 UJ	69 UJ	--
Benzene	12 J	BDL	BDL	10,000
Toluene	BDL	BDL	5 J	--
Total VOCs	12	BDL	5	
TICs				
Alkylaromatic hydrocarbons	32 J	BDL	BDL	
Oxygenated aromatics	97 J	BDL	BDL	
Total TICs	129	BDL	BDL	

Notes:

a UJ = Estimated quantitation limit
b -- = TCLP limit not assigned to analyte
c J = Estimated concentration value
d BDL = Below detection limit

TABLE 5-17
SVOC CONCENTRATIONS IN SEDIMENT SAMPLES COLLECTED 5/5/94
(Results in ppb)

SVOC	F1400S	K600N	I00	L1200S	L1200S-D	J1400S	TCLP x 20
1,4-DCB	87 J[a]	BDL[b]	BDL	BDL	BDL	BDL	150,000
4-Methylphenol	BDL	BDL	BDL	290 J	380 J	BDL	4,000,000
Naphthalene	83 J	BDL	BDL	BDL	BDL	BDL	--[c]
2-Methylnaphthalene	100 J	BDL	BDL	BDL	BDL	BDL	--
Acenaphthylene	150 J	BDL	BDL	69 J	81 J	BDL	--
Phenanthrene	800	BDL	650	1,200 J	1,600 J	460 J	--
Dibenzofuran	BDL	BDL	BDL	50 J	68 J	BDL	--
Anthracene	300 J	BDL	110 J	270 J	380 J	BDL	--
Carbazole	BDL	BDL	95 J	120 J	140 J	BDL	--
Fluoranthene	1,600	150 J	1,400	3,000 J	3,200 J	1,400	--
Pyrene	1,800	BDL	1,200	2,100 J	2,200 J	1,300	--
Butyl benzyl phthalate	BDL	BDL	BDL	BDL	570 UJ[d]	BDL	--
Benzo(a)anthracene	1,900	BDL	800	1,600 J	1,700 J	620 J	--
Chrysene	1,600	140 J	980	1,600 J	1,800 J	1,100	--
Di-n-octyl phthalate	BDL	BDL	BDL	460 UJ	570 UJ	BDL	--
[illegible]2-Ethylhexyl)phthalate	720 UJ	1,400 UJ	560 UJ	1,200 UJ	1,500 UJ	850 UJ	--
Benzo(b)fluoranthene	1,800	140 J	1,500	2,600 J	2,400 J	1,600	--
Benzo(a)pyrene	730	BDL	470 J	690 J	700 J	560 J	--
Indeno(1,2,3-cd)pyrene	430 J	BDL	330 J	470 J	460 J	370 J	--
Total SVOCs	11,380	430	7,535	14,059	15,109	7,410	
TICs							
Hydrocarbons	27,000 J	14,000 J	13,000 J	29,000 J	39,000 J	24,000 J	
Oxygenated hydrocarbons	12,000 J	2,300 J	810 J	10,000 J	3,400 J	4,600 J	
Cyclic oxygenated hydrocarbons	38,000 J	16,000 J	3,400 J	16,000 J	18,000 J	25,000 J	
Oxygenated aromatics	BDL	1,200 J	BDL	2,400 J	1,900 J	BDL	
PAHs	BDL	BDL	600 J	BDL	2,100 J	BDL	
Heterocyclic aromatics	BDL	BDL	BDL	BDL	2,800 J	BDL	
Total TICs	77,000	33,500	17,810	57,400	67,200	53,600	

Notes:

a J = Estimated concentration value
b BDL = Below laboratory method detection limits
c -- = TCLP limit not assigned to analyte
d UJ = Estimated quantitation limit

TABLE 5-18

SVOC CONCENTRATIONS IN SEDIMENT SAMPLES COLLECTED 09/14/94
(Results in ppb)

SVOC	SED-1	SED-1-DUP	SED-2	TCLP x 20
bis(2-ethylhexyl)phthalate	BDL[a]	BDL	930 UJ[b]	--[c]
Total SVOCs	BDL	BDL	BDL	
TICs				
Unknowns	910 J[d]	1,300 J	290 J	
Total TICs	910 J	1,300 J	290 J	

Notes:

a BDL = Below detection limit
b UJ = Estimated quantitation limit
c -- = TCLP limit not assigned to analyte
d J = Estimated concentration value

TABLE 5-19
TOTAL METAL CONCENTRATIONS IN SEDIMENT SAMPLES COLLECTED 5/5/94
(Results in parts per million [ppm])

Metal	F1400S	K600N	I00	L1200S	L1200S-D	J1400S	TCLP x 20
Aluminum	14,300	13,400	7,400	4,830	4,470	14,700	--[a]
Arsenic	11.5	11.8	3.4	3.6	2.7 J	6.2	100
Barium	764	575	143	78.8	75.3	204	2,000
Beryllium	1.5 J[b]	0.65 J	0.42 J	0.32 J	0.30 J	0.77 J	--
Cadmium	13.7	16.7	3.5	2.6	3.3	4.2	20
Calcium	80,600	61,900	22,600	14,200	13,100	23,100	--
Chromium	65.2	**329**[c]	76.2	42.3	51.2	59.3	100
Cobalt	16.8 J	13.7 J	7.5 J	4.9 J	4.7 J	14.1 J	--
Copper	189	525	104	56.6	60.5	86.4	--
Iron	194,000	27,500	15,200	14,500	12,300	37,300	--
Lead	**176**	**463**	60.6	51	37.6	**113**	100
Magnesium	15,500	9,410	6,540	4,990	4,140	10,700	--
Manganese	2,260	724	449	407	335	1300	--
Mercury	0.84	0.18 J	BDL[d]	BDL	BDL	BDL	4
Nickel	54.9	90.3	34.3	BDL	BDL	BDL	--
Potassium	2,260 J	1,700 J	897 J	564 J	545 J	1,500 J	--
Selenium	1.6 J	BDL	BDL	BDL	BDL	BDL	20
Silver	BDL	20.9	4.8	2.8 J	2.3 J	BDL	100
Sodium	2,970 J	BDL	836 J	1,150 J	705 J	BDL	--
Vanadium	59.9	30.1	27.8	19.9	18	56.3	--
Zinc	1,130	1,220	261	161	143	336	--

Notes:

a -- = TCLP limit not assigned to analyte
b J = Estimated concentration value
c **Shaded bold values** indicate that concentration exceeds TCLP x 20
d BDL = Below laboratory method detection limits

TABLE 5-20

TOTAL METAL CONCENTRATIONS IN SEDIMENT SAMPLES COLLECTED 09/14/94
(Results in ppm)

Metal	SED-1	SED-1-DUP	SED-2	TCLP x 20
Aluminum	18,500	22,800	18,900	--[a]
Antimony	BDL[b]	51.9 J[c]	21.0 J	--
Arsenic	12.6	14.4	8.9	100
Barium	895	1,040	728	2,000
Beryllium	1.4 UJ[d]	1.2 UJ	1.1 UJ	--
Cadmium	**43.7 J[e]**	**43.2 J**	**77.6 J**	20
Calcium	106,000	107,000	118,000	--
Chromium	**479**	**532**	**832**	100
Cobalt	19.2 J	19.0 J	56.8	--
Copper	942	1,070	1,430	--
Iron	48,700	40,000	32,300	--
Lead	**704 J**	**861 J**	**596 J**	100
Magnesium	12,700	14,500	9,340	--
Manganese	1,160	971	696	--
Mercury	0.36 J	0.32 J	0.78 J	4
Nickel	200	180	255	--
Potassium	5,450 J	4,510	2,970	--
Selenium	5.7 UJ	3.6 UJ	2.6 UJ	20
Silver	37.7	43.6	45.2	100
Sodium	1,940 J	1,710 J	1,100 J	--
Vanadium	49.1 J	58.3	40.8	--
Zinc	1,850	2,140	2,030	--
Cyanide	0.72 J	BDL	0.36 J	--

Notes:

a -- = TCLP limit not assigned to analyte
b BDL = Below detection limit
c J = Estimated concentration value
d UJ = Estimated quantitation limit
e **Shaded bold values** indicate that concentration exceeds TCLP x 20

TABLE 5-21
PESTICIDE CONCENTRATIONS IN SEDIMENT SAMPLES COLLECTED 5/5/94
(Results in ppb)

Pesticide	F1400S	I00	J1400S	K600N	L1200S	L1200S-D
4,4'-DDE	23	4.8 J[a]	BDL[b]	BDL	2.8 J	5.7 J
4,4'-DDT	45 J	BDL	BDL	BDL	BDL	BDL
4,4'-DDD	13	3.1 J	BDL	9.6 J	BDL	BDL
Aldrin	BDL	BDL	BDL	4.8 J	BDL	BDL
Gamma chlordane	BDL	BDL	2.5 J	BDL	1.8 J	3.6 J

Notes:

a J = Estimated concentration value
b BDL = Below laboratory method detection limits

TABLE 5-22

PCB CONCENTRATIONS IN SEDIMENT SAMPLES COLLECTED 09/14/94
(Results in ppb)

PCB	SED-1	SED-1-DUP	SED-2
Aroclor-1248	220 J[a]	270 J	BDL[b]
Aroclor-1254	240 J	BDL	BDL

Notes:

a J = Estimated concentration value
b BDL = Below detection limit

TABLE 5-23

VOC CONCENTRATIONS IN TRENCH SOIL SAMPLES
(Results in ppb)

VOC	T2-1	T2-1-DUP	T3-1	TCLP x 20
Methylene chloride	12 UJ[a]	13 UJ	BDL[b]	--[c]
Acetone	40 UJ	54 UJ	35 UJ	--
Toluene	BDL	2 J[d]	BDL	--
Chlorobenzene	19	20	BDL	2,000
Ethylbenzene	7 J	9 J	BDL	--
Xylenes (Total)	26	17	BDL	--
Total VOCs	52	48	BDL	
TICs				
Hydrocarbons	40 J	870 J	BDL	
Oxygenated hydrocarbons	45 J	BDL	BDL	
Alkylaromatic hydrocarbons	268 J	410 J	86 J	
Halogenated aromatics	99 J	50 J	5 J	
Oxygenated aromatics	BDL	BDL	BDL	
Unknowns	95 J	670 J	134 J	
Total TICs	547 J	2000 J	225 J	

Notes:

a UJ = Estimated quantitation limit
b BDL = Below detection limit
c -- = TCLP limit not assigned to analyte
d J = Estimated concentration value

TABLE 5-24

SVOC CONCENTRATIONS IN TRENCH SOIL SAMPLES
(Results in ppb)

SVOC	T2-1	T2-1-DUP	T3-1	TCLP x 20
1,4-Dichlorobenzene	**160 J**[ab]	**220 J**	BDL[c]	150
Naphthalene	69 J	BDL	BDL	--[d]
2-Methylnaphthalene	64 J	140 J	BDL	--
Acenaphthene	BDL	76 J	BDL	--
Diethylphthalate	410 UJ[e]	BDL	420 UJ	--
Fluorene	BDL	72 J	BDL	--
N-nitrosodiphenylamine	120 J	380 J	BDL	--
Phenanthrene	BDL	520 J	110 J	--
Anthracene	BDL	100 J	BDL	--
Di-n-butylphthalate	410 UJ	440 UJ	420 UJ	--
Fluoranthene	BDL	380 J	160 J	--
Pyrene	BDL	830 J	140 J	--
Butylbenzylphthalate	410 UJ	440 UJ	420 UJ	--
Chrysene	BDL	320 J	74 J	--
bis(2-ethylhexyl)phthalate	1700 UJ	920 UJ	720 UJ	--
Di-n-octylphthalate	410 UJ	BDL	BDL	--
Benzo(b)fluoranthene	BDL	BDL	100 J	--
Benzo(a)pyrene	BDL	BDL	63 J	--
Total SVOCs	413	3038	647	
TICs				
Hydrocarbons	21,440 J	81,630 J	9,240 J	
Oxygenated hydrocarbons	30,250 J	BDL	3,620 J	
Oxygenated aromatics	67,000 J	BDL	BDL	
Polynuclear aromatic hydrocarbons	1,700 J	BDL	330 J	
Amines/Amides	BDL	BDL	840 J	
Unknowns	20,410 J	29,880 J	2,220 J	
Total TICs	140,800 J	111,510 J	16,250 J	

Notes:

[a] **Shaded bold values** indicate that concnetration exceeds TCLP x 20
[b] J = Estimated concentration value
[c] BDL = Below detection limit
[d] -- = TCLP limit not assigned to analyte
[e] UJ = Estimated quantitation limit

TABLE 5-25

METAL CONCENTRATIONS IN TRENCH SOIL SAMPLES
(Results in ppm)

Metal	T2-1	T2-1-DUP	T3-1	TCLP x 20
Aluminum	6,540	5,340	17,000	--[a]
Antimony	13.5 UJ[b]	12.3 UJ	17.0 UJ	--
Arsenic	4.7	2.4 J	2.7	100
Barium	112	99.2	520	2,000
Beryllium	0.50 UJ	0.43 UJ	0 89 UJ	--
Cadmium	2.3 UJ	2.4 UJ	**25.4 J**[cd]	20
Calcium	14,900	31,300	100,000	--
Chromium	39.1	55.9	**816**	100
Cobalt	7.0 J	5.7 J	11.1 J	--
Copper	422	146	764	--
Iron	18,200	32,000	37,900	--
Lead	81.4 J	100 J	**506 J**	100
Magnesium	5,130	12,600	8,150	--
Manganese	415 J	565 J	498 J	--
Mercury	0.34 J	0.36 J	0.22 J	4
Nickel	33.9 J	62.3 J	215 J	--
Potassium	1,060 J	4,030 UJ	804 UJ	--
Selenium	0.82 J	0.53 UJ	1.8	20
Silver	9.8 J	30.3 J	26.5 J	100
Sodium	343 J	400 J	646 J	--
Vanadium	21.6	20.9	32.2	--
Zinc	393	321	1410	--
Cyanide	0.31 UJ	0.17 UJ	0.32 J	--

Notes:

[a] -- = TCLP limit no assigned for analyte
[b] UJ = Estimated quantitation limit
[c] J = Estimated concentration value
[d] **Shaded bold values** indicate that concentration exceeds TCLP x 20

TABLE 5-26

PCB CONCENTRATIONS IN TRENCH SOIL SAMPLES
(Results in ppb)

PCB	T2-1	T2-1-DUP	T3-1
Aroclor-1016	BDL[b]	BDL	310
Aroclor-1254	110 J[a]	BDL	210
Aroclor-1260	BDL	BDL	180 J

Notes:

a J = Estimated concentration value
b BDL = Below detection limit

6.0 CONCLUSIONS AND RECOMMENDATIONS

Results of analytical data for groundwater, surface water, and sediments samples collected at the Pig's Eye site indicate that a significant impact to the environment has occurred from the Pig's Eye site. The presence of organic and inorganic contaminants in on-site groundwater indicate that contaminants from the fill material are traveling through the upper water-bearing unit. The lower water-bearing unit below the organic silt and peat unit has also been impacted by contaminants from the fill material. The lack of a confining layer between the fill material and bedrock indicates that the underlying Prairie du Chien-Jordan Aquifer is highly vulnerable to contamination.

The extent of organic and inorganic contaminants in sediments from Battle Creek and Pig's Eye Lake indicate that significant impact to these water bodies has occurred from the Pig's Eye site. Elevated concentrations of pesticides such as 4,4-DDT and 4,4-DDD and metals such as lead and chromium pose a serious ecological and human health risk. Elevated concentrations of contaminants are particularly high near the battery casing disposal area at the south end of the site near Pig's Eye Lake.

On- and off-site surface water has also been impacted by past waste management operations at the site. The most contaminated area is near the battery casing disposal area, where elevated concentrations of metals are present in a pond connected to Pig's Eye Lake. Numerous leachate seeps also drain into Battle Creek, the unnamed ditch east of the site, and Pig's Eye Lake.

In order to further characterize site conditions, PRC recommends the following activities for additional study at the Pig's Eye site:

- Additional monitoring wells should be installed in the deeper unconsolidated valley fill deposits underlying the site. If groundwater from these wells also shows contamination, installation of bedrock monitoring wells at the site should be considered.

- Groundwater samples from the monitoring wells should also be analyzed for oxygen, nitrates, and sulfates to determine whether or not natural bioremediation is occurring at the site.

- Monitoring well nests should be installed in the shallow and deeper water-bearing units to determine if the organic silt and peat unit acts as a semiconfining or confining unit at the site.

- Seismic or other nonintrusive geophysical survey methods, such as a gravity survey, should be performed to locate the axis of the buried valley.

- TCLP analysis of the ash from the ash disposal area and soil and sediment near the battery casings disposal area should be performed to determine if the materials are Resource Conservation and Recovery Act (RCRA) hazardous wastes. If TCLP analysis indicates that this material is above TCLP limits for RCRA hazardous waste, the soil, battery casings, and ash should either be removed or remediated.

- Invertebrate sampling and additional sediment sampling in Battle Creek and Pig's Eye Lake should be conducted in order to assess potential impact of the site on the food chain in the area.

7.0 REFERENCES

Bureau of Census. 1990. Summary of Population and Housing Characteristics for Minnesota.

Kanivetsky, Roman and Jane M. Cleland. 1992. *Geologic Atlas of Ramsey County, Minnesota.* Surficial Hydrogeology, Plate 6. County Atlas Series C-7. ed. by Gary N. Meyer and Lynn Swanson.

Minnesota Department of Health. 1991. Recommended Allowable Limits for Drinking Water Contaminants, Release No. 3.

Minnesota Pollution Control Agency (MPCA). 1989. Screening Site Investigation of the Pig's Eye Site. October 11.

MPCA. 1992. Expanded Site Investigation of the Pig's Eye Site. December 11.

Mossler, John H. 1987. *Paleozoic Lithostratigraphic Nomenclature for Minnesota.* Minnesota Geological Survey, Report of Investigations 36. 36 Pages.

Mossler, John H. 1992. *Geologic Atlas of Ramsey County, Minnesota.* Bedrock Topography Map, Plate 4. County Atlas Series C-7. Edited by Gary N. Meyer and Lynn Swanson.

Mossler, John H. and Bruce A. Bloomgren. 1992. *Geologic Atlas of Ramsey County, Minnesota.* Bedrock Geology, Plate 2. County Atlas Series C-7. Edited by Gary N. Meyer and Lynn Swanson.

Mossler, John H. and Jane M. Cleland. 1992. *Geologic Atlas of Ramsey County, Minnesota.* Depth to Bedrock Maps and Confining Units of the St. Peter Sandstone, Plate 5. County Atlas Series C-7. Edited by Gary N. Meyer and Lynn Swanson.

Patterson, Carrie J. 1992. *Geologic Atlas of Ramsey County, Minnesota.* Surficial Geology, Plate 3. County Atlas Series C-7. Edited by Gary N. Meyer and Lynn Swanson.

U.S. Department of Agriculture (USDA). 1980. *Soil Survey of Washington and Ramsey Counties, Minnesota.* Soil Conservation Service.

U.S. Environmental Protection Agency (EPA). 1981. Notification of Hazardous Waste Form, Submitted by Unknown Waste Hauler. Exact Date Unkown.

EPA. 1983. Preliminary Assessment of the Pig's Eye dump site. Performed by Ecology and Environment. Exact Date Unknown.

EPA. 1988. Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA. Office of Emergency and Remedial Response.

EPA. 1992. Quality Criteria for Water.